

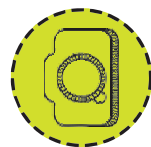
CBSE
Mind Maps
CLASS 12
CHEMISTRY



Prepare, Revise & Practice Online on
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MIND MAPS

LEARNING MADE SIMPLE



Presenting words and concepts as pictures!!



anytime, as frequency as you like till it becomes a habit!



When?

- To Unlock the imagination and come up with ideas
- To Remember facts and figures easily
- To Make clearer and better notes
- To Concentrate and save time
- To Plan with ease and ace exams

What?

MIND MAP
AN INTERACTIVE MAGICAL TOOL

Why?



Learning made simple
'a winning combination'

Result

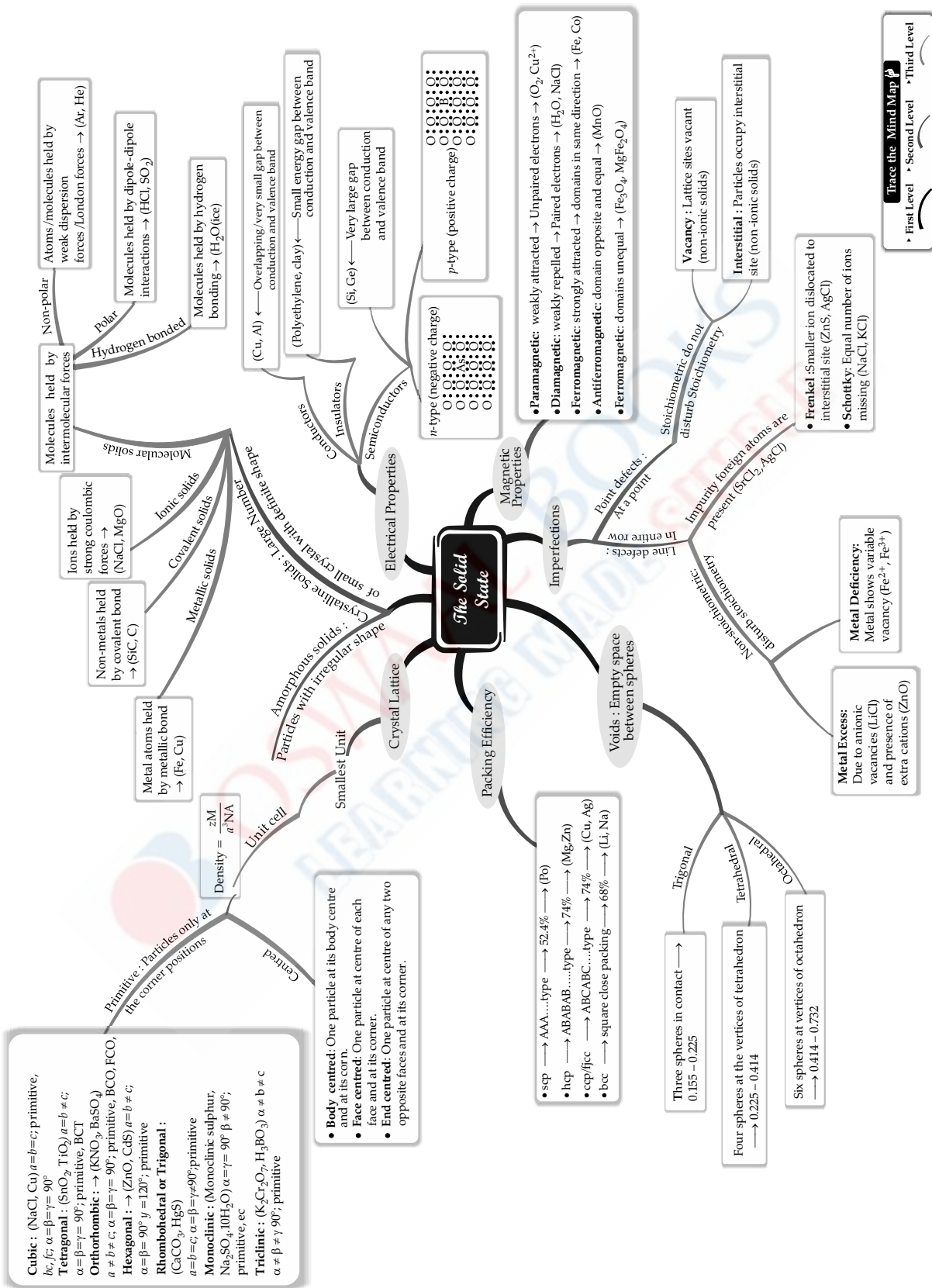


With a blank sheet of paper
COLOURED PENS and
your creative imagination!

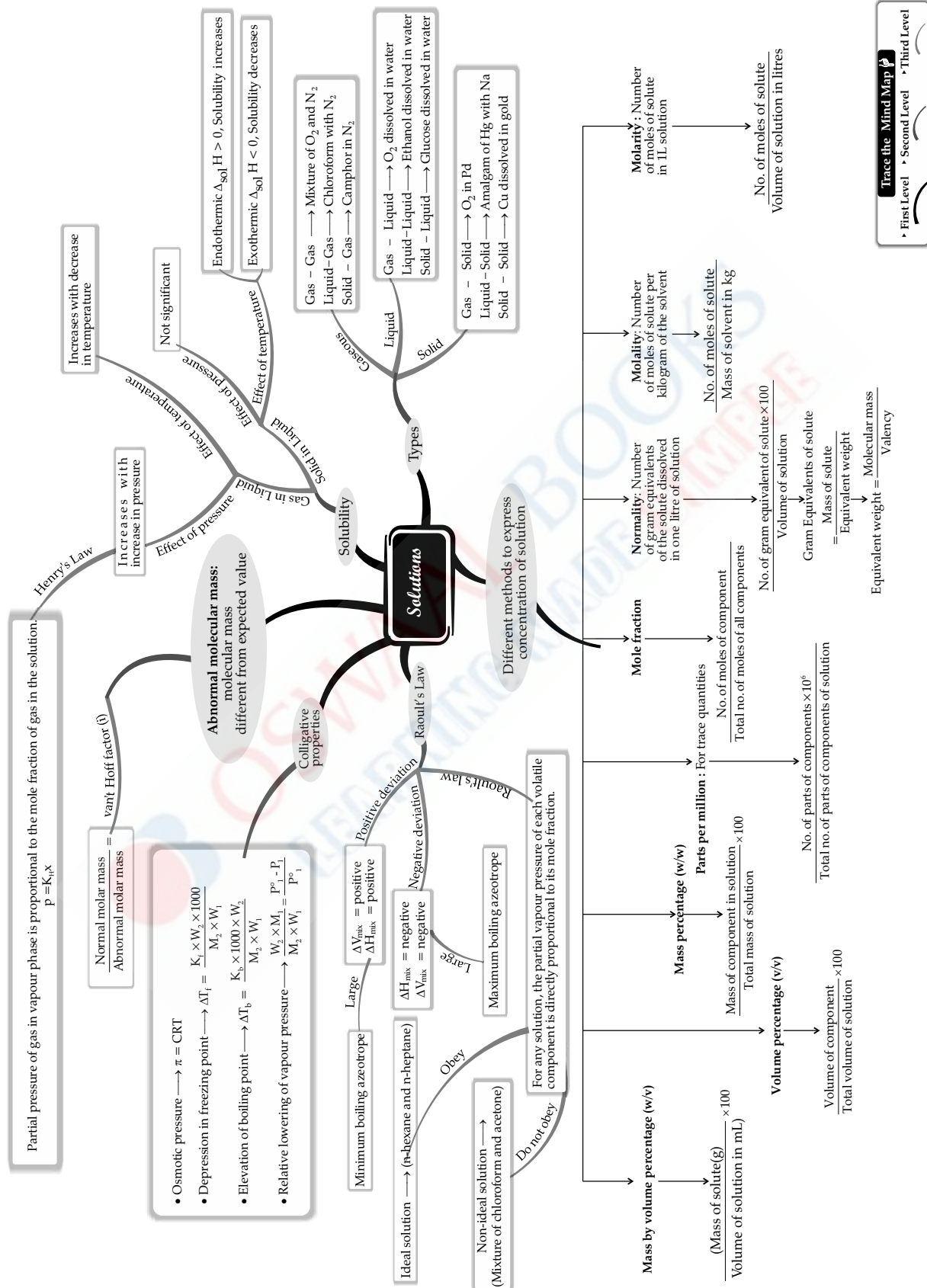
How?

What are Associations?

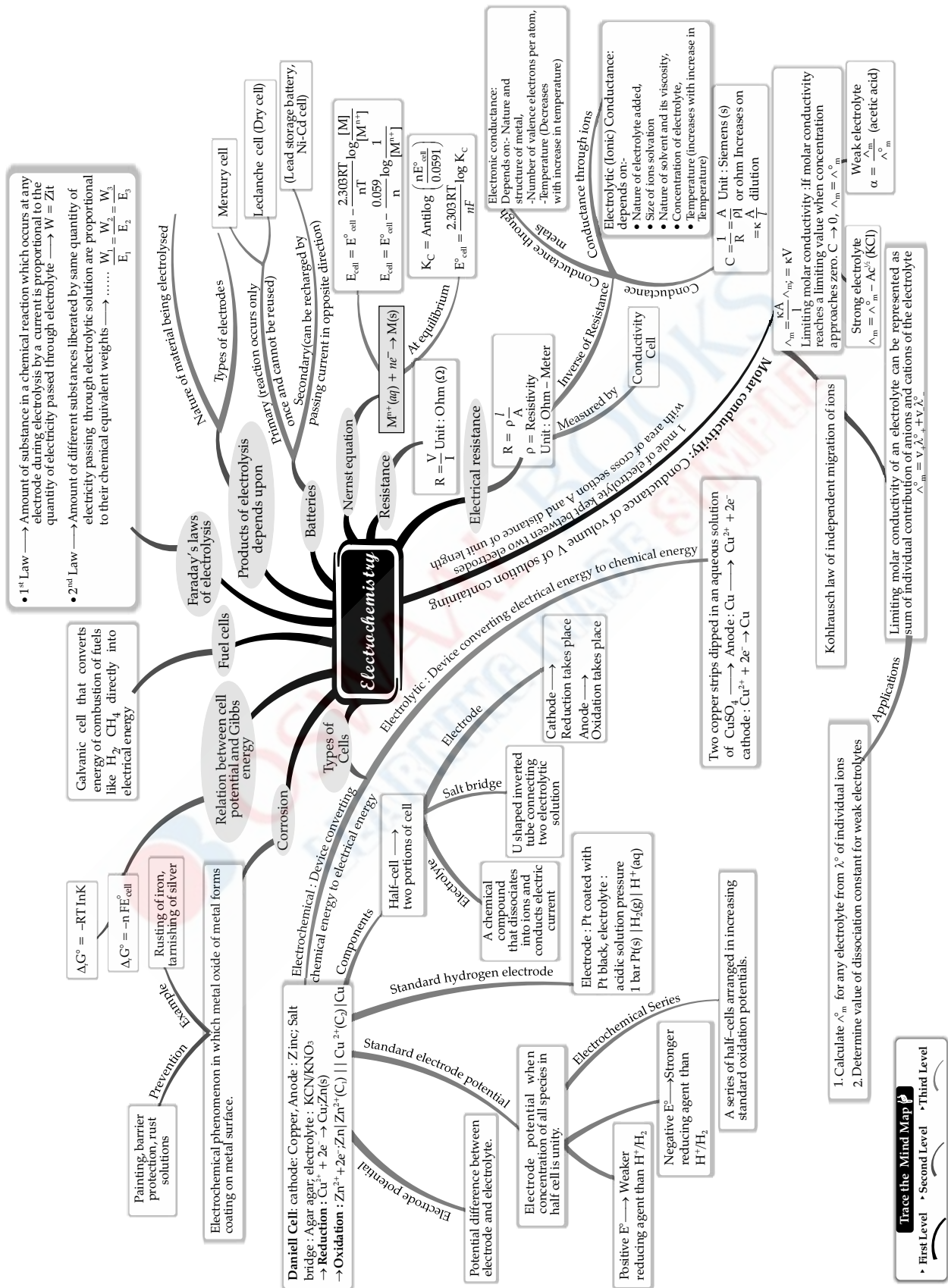
It's a technique connecting the core concept at the Centre to related concepts or ideas. Associations spreading out straight from the core concept are the First Level of Association. Then we have a Second Level of Association emitting from the first level and the chronology continues. The thickest line is the First Level of Association and the lines keep getting thinner as we move to the subsequent levels of association. This is exactly how the brain functions, therefore these Mind Maps. Associations are one powerful memory aid connecting seemingly unrelated concepts, hence strengthening memory.

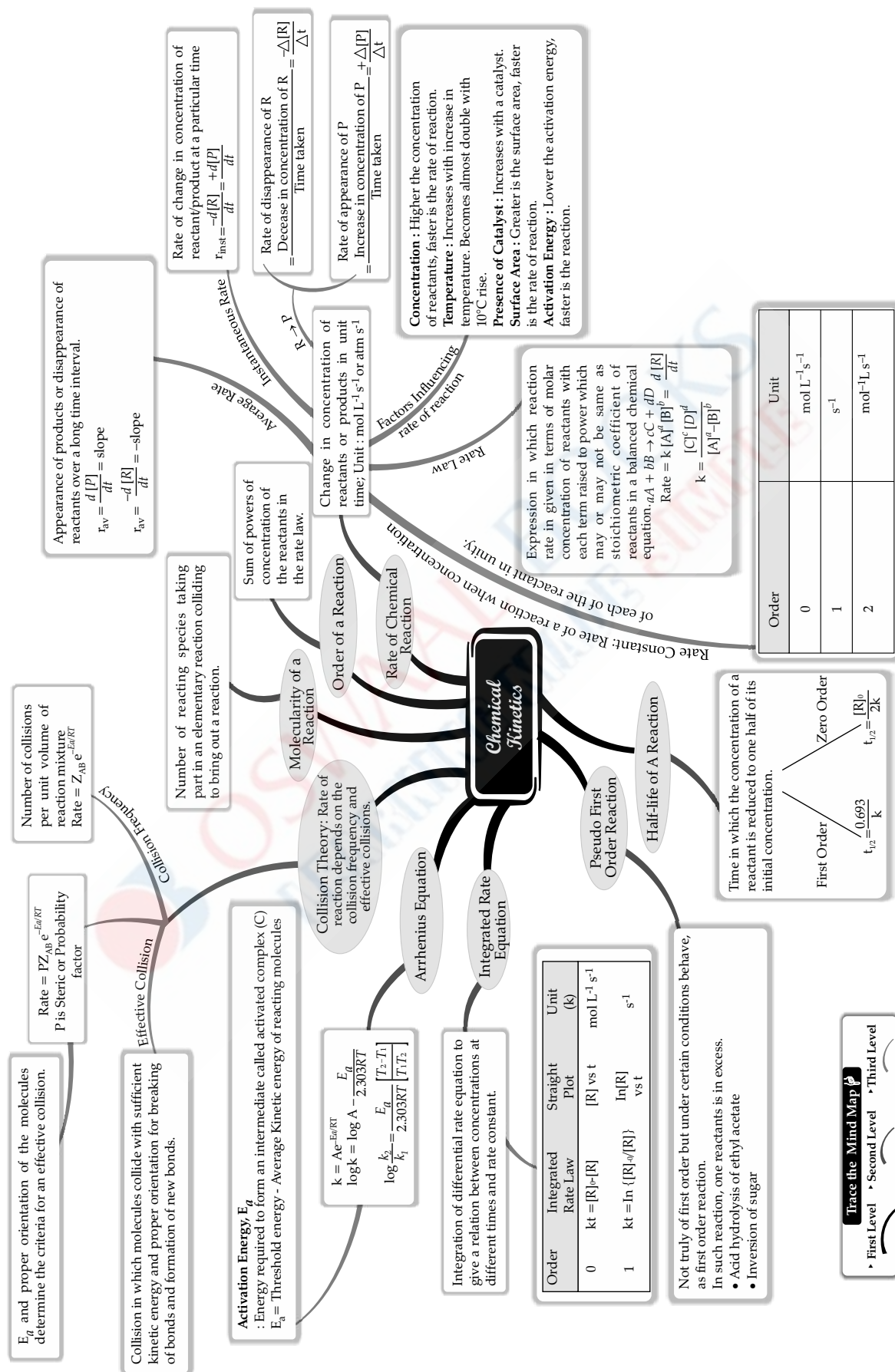


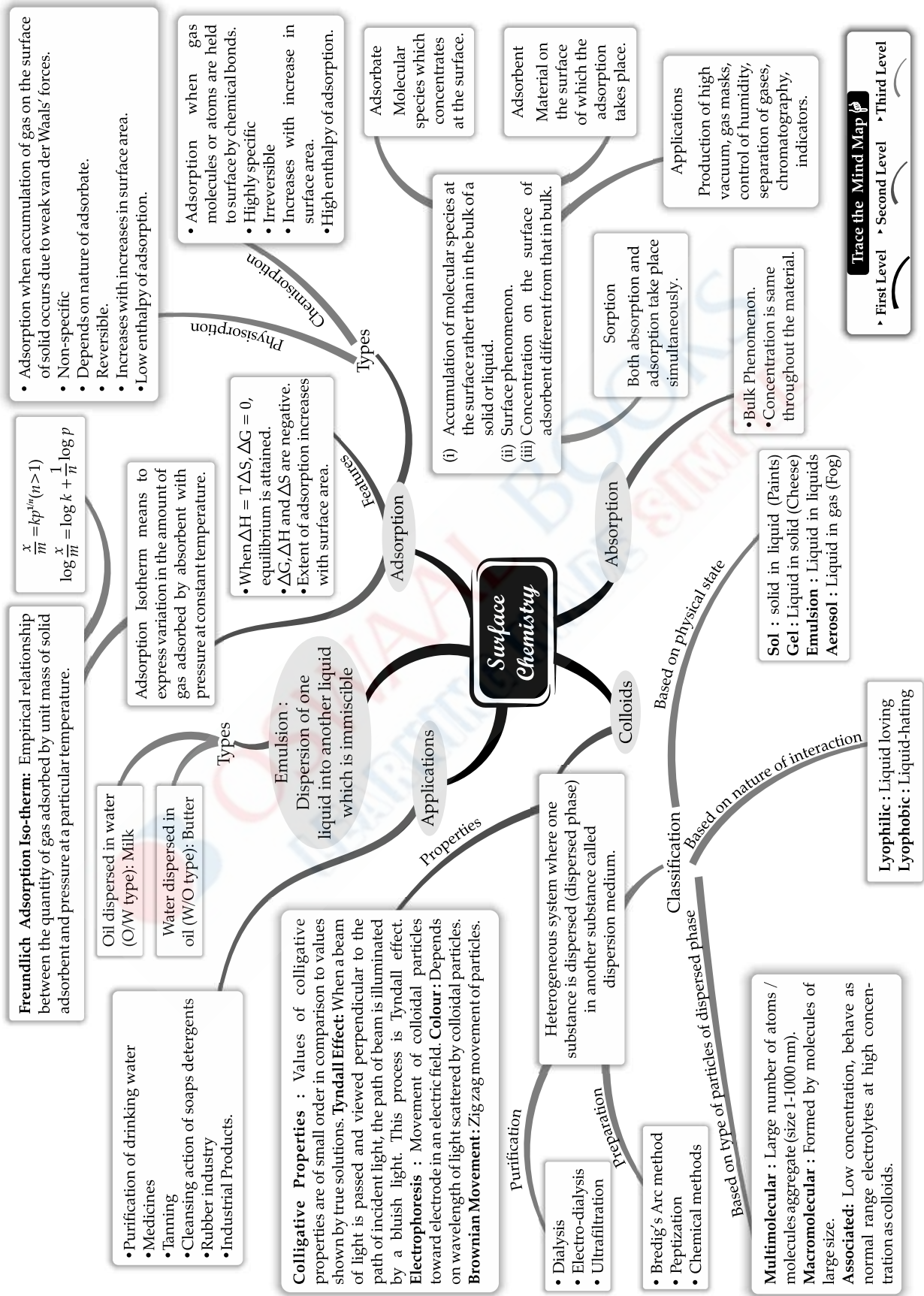
Trace the Mind Map \rightarrow First Level \rightarrow Second Level \rightarrow Third Level



Trace the Mind Map
 • First Level → Second Level → Third Level

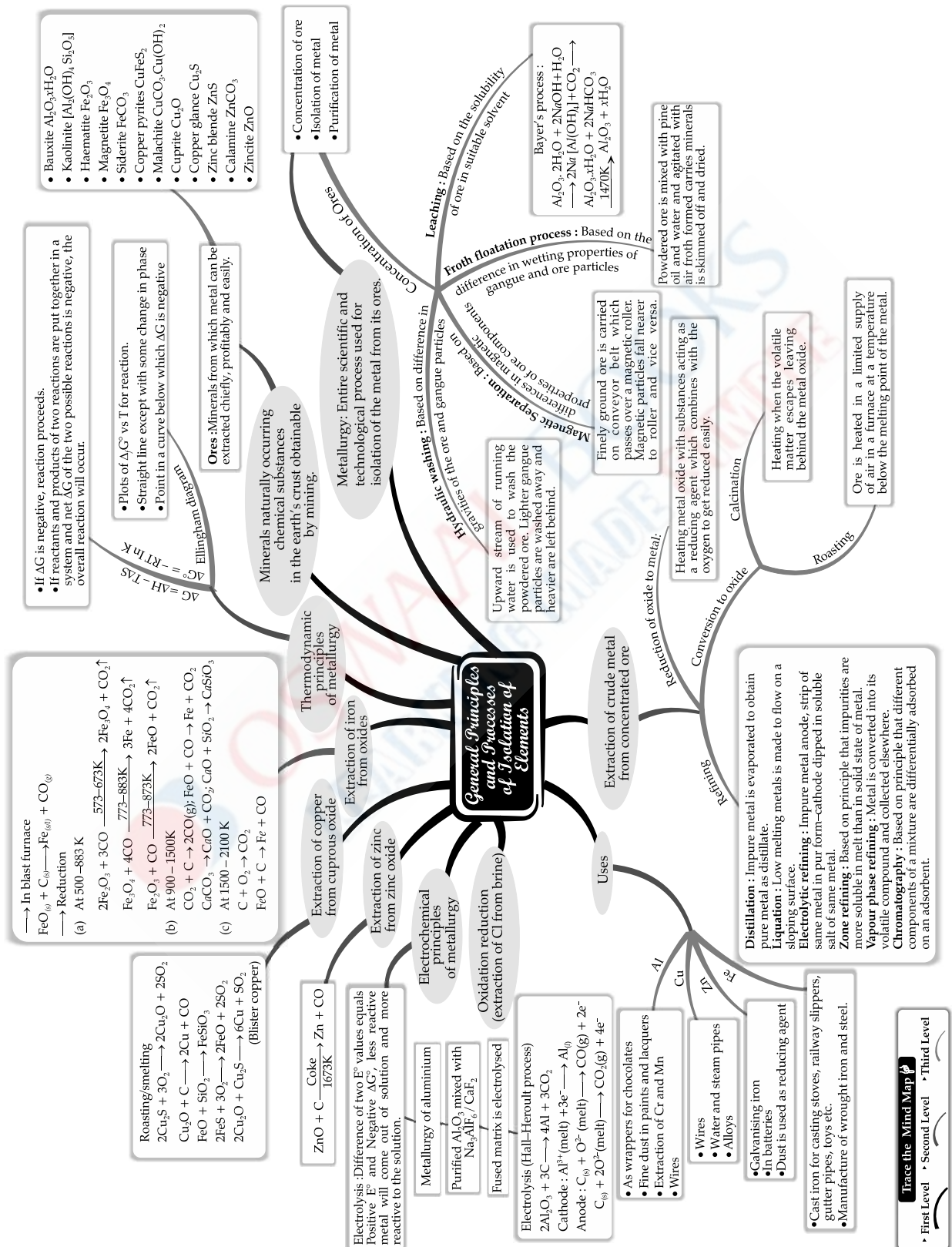


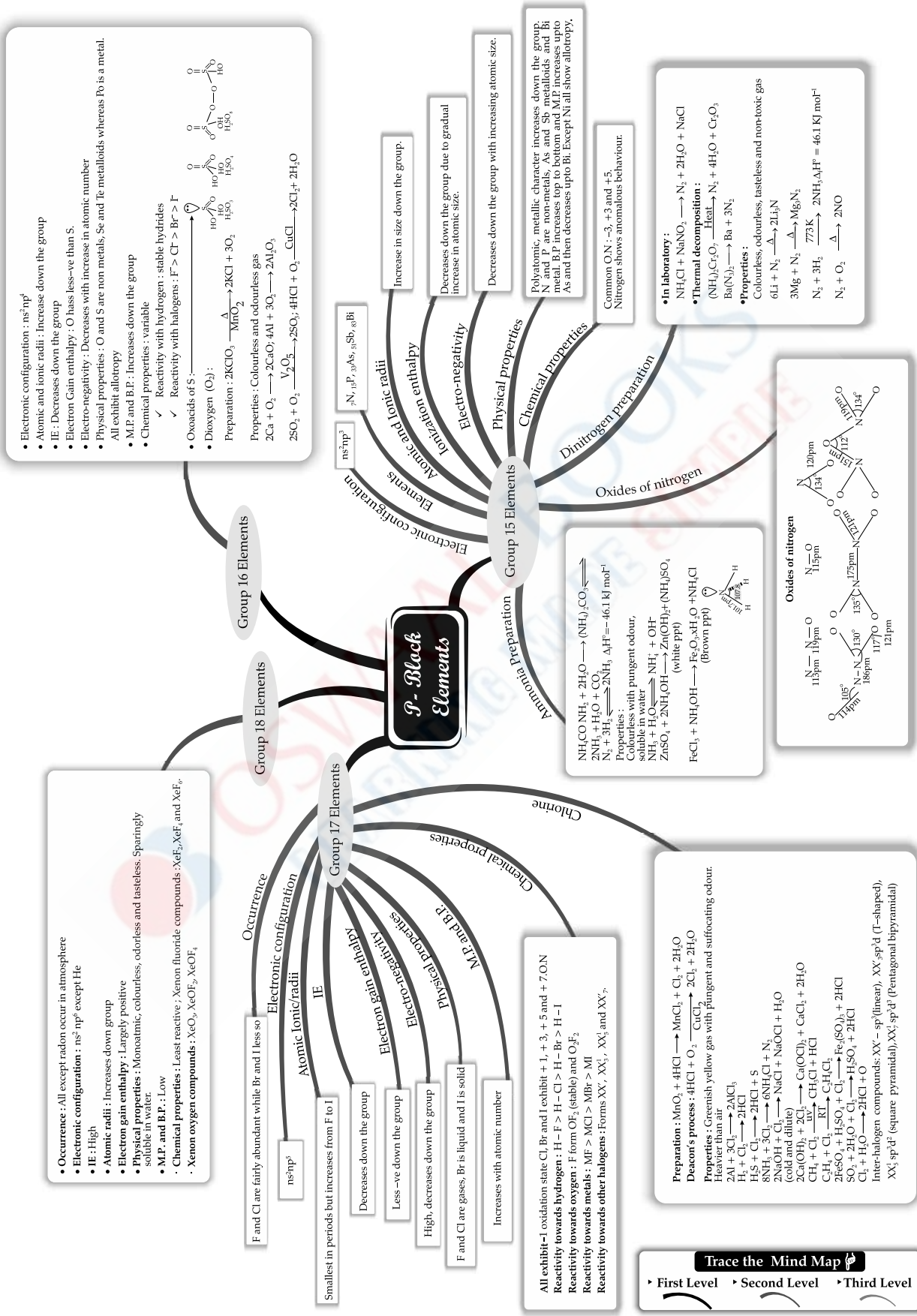




Trace the Mind Map

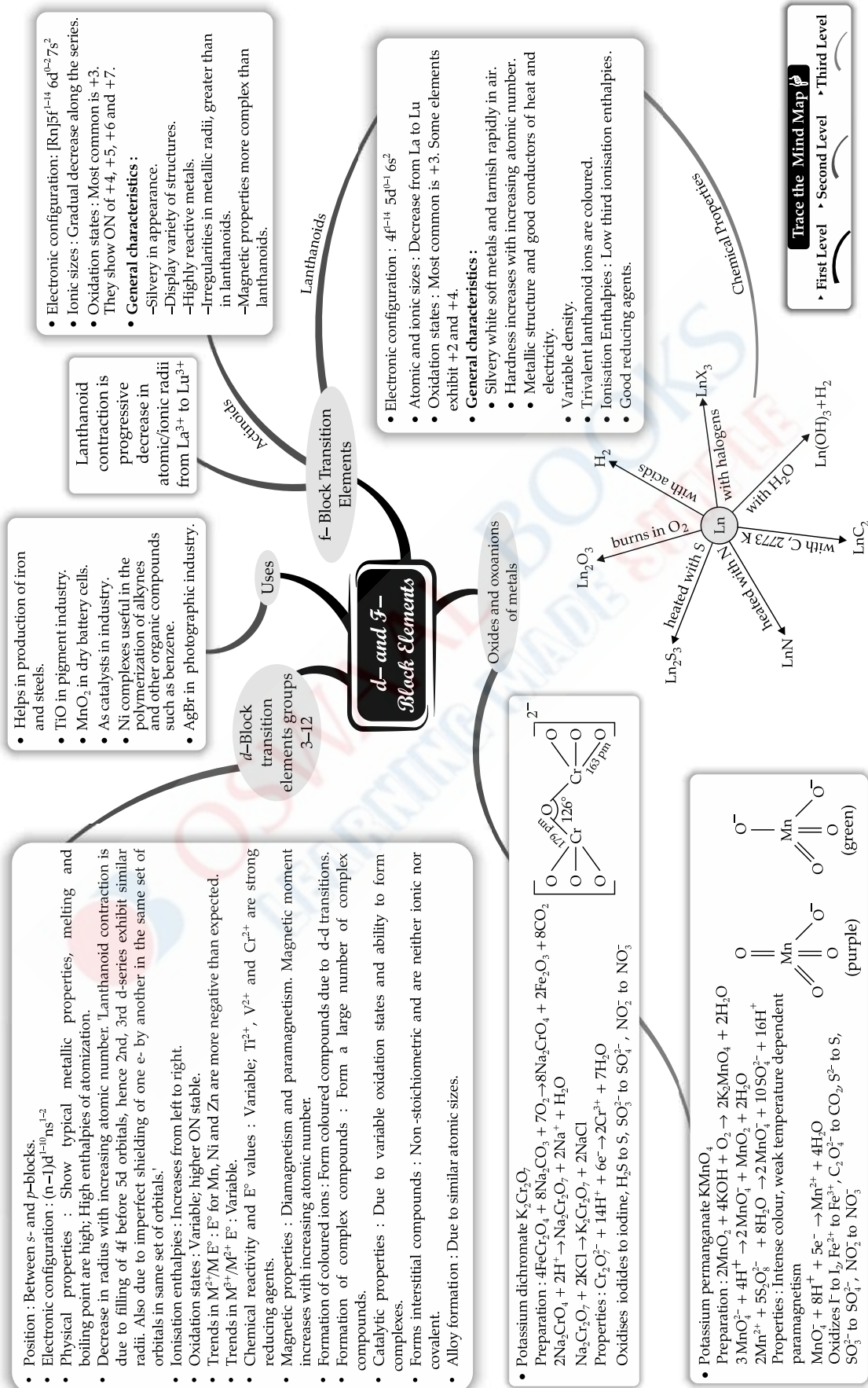
- First Level
- Second Level
- Third Level

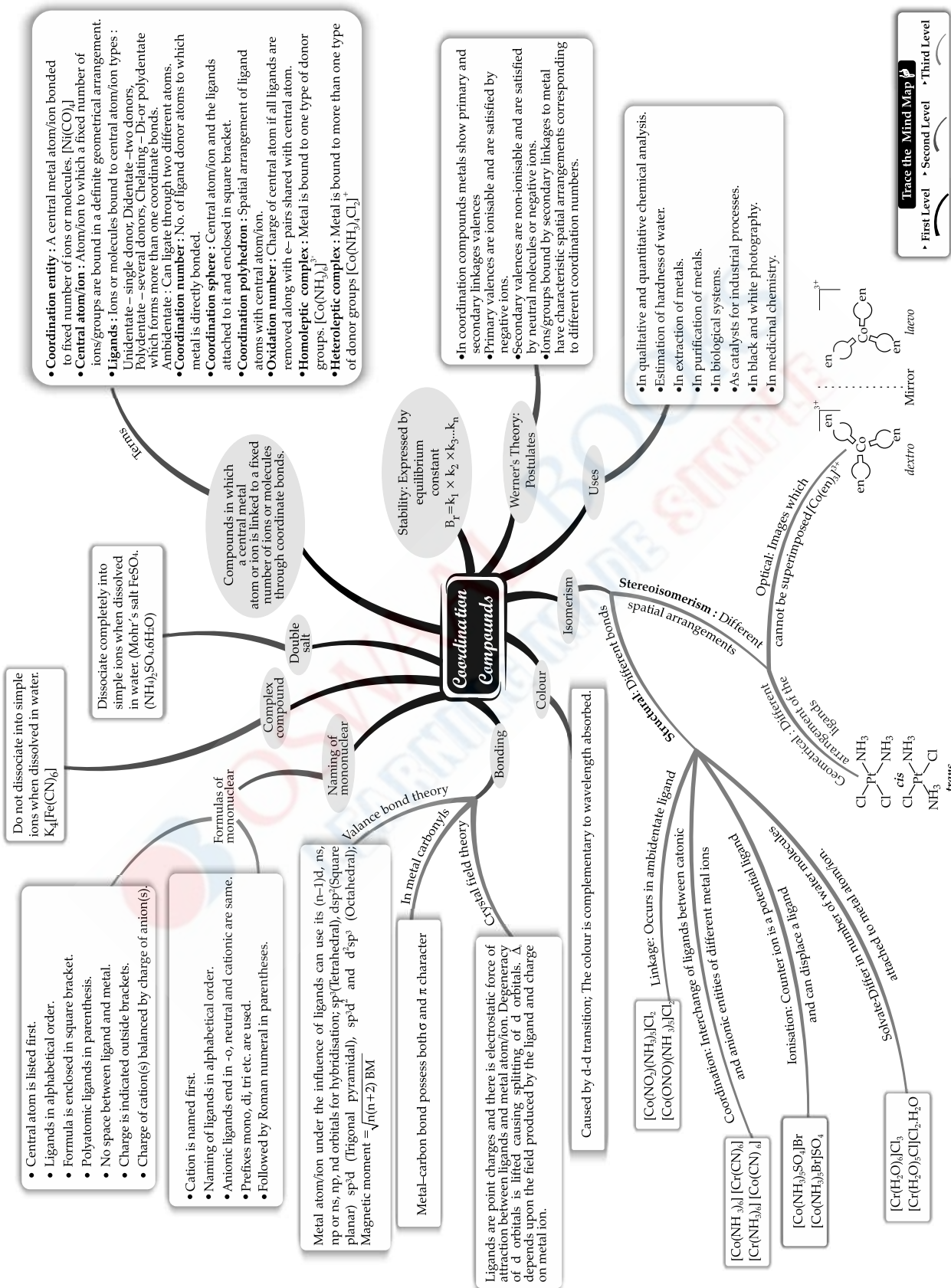




Trace the Mind Map

► First Level ► Second Level ► Third Level





Trace the Mind Map

- First Level
- Second Level
- Third Level

Chloroform

- Solvent for fats, alkalooids, I etc.
- Production of freon.

Iodoform

- Antiseptic

Carbon tetrachloride

- For aerosol propellants, refrigeration and air conditioning purposes.

Freons

- As insecticide

DDT

- Dichloromethane

Uses:

- Paint remover.
- Propellant in aerosols.
- Metal cleaning and finishing solvent.

Haloalkanes and Haloarenes

Recemisation S_N1

- Chiral : Objects which are non-superimposable.
- Achiral : Objects which are superimposable.

Polyhalogen compounds

- (a) Dextro (+/d)
- (b) Laevo (-/l)

Haloalkanes

Haloarenes

Classification

- No. of halogen atoms
- C_2H_5X Monohaloalkane
- CH_2X Dihalooalkane
- CH_2X Trihalooalkane
- Monohaloarene Dihalooarene Trihalooarene
- Compounds containing sp^3 C-X bond
- (a) Alkyl halides
- (b) Allylic halides
- (c) Benzylic halides
- Compounds containing sp^2 C-X bond
- (a) Vinylic halides
- (b) Aryl halides
- Nomenclature
- Common name : Alkyl group followed by halides. Dihalogen derivatives, prefixes o-, m-, p- are used.
- IUPAC name : Numerals are used.
- Nature of C-X bond
- Carbon-halogen bond is polarized.

Reactions :

(a) Nucleophilic substitution

(i) Resonance effect

(ii) Hybridisation of C in C-X bond : Haloalkane $-sp^3$; Haloarene $-sp^2$

(iii) Phenyl cation unstabilised by resonance

(i) $NaOH, 623K, 300atm$

(ii) H^+

(i) $NaOH, 443K$

(b) Electrophilic substitution

$+ Cl_2 \xrightarrow{Anhyd. FeCl_3}$

$\xrightarrow{HNO_3, conc. H_2SO_4}$

$\xrightarrow{conc. H_2SO_4, \Delta}$

Friedel-Crafts reaction

$+ CH_3Cl \xrightarrow{Anhyd. AlCl_3}$

$+ H_2C=O \xrightarrow{Anhyd. AlCl_3}$

(c) Reaction with metals

Wurtz-Fittig reaction

$2 \text{ Aryl-X} + 2Na \xrightarrow{Ether} \text{Biaryl} + 2NaX$

Fittig reaction

$2 \text{ Aryl-X} + 2Na \xrightarrow{Ether} \text{Biaryl} + 2NaX$

=>Preparation

- From alcohol : $ZnCl_2, R-OH + HCl \xrightarrow{} R-Cl + H_2O$
- $3R-OH + PX_3 \xrightarrow{} 3R-X + H_3PO_3$
- $ROH + PCl_5 \xrightarrow{} R-Cl + POCl_3 + HCl$

From hydrocarbons :

(a) By free radical halogenation

$CH_3CH_2CH_2CH_3 \xrightarrow{Cl_2/h\nu} CH_3CH_2CH_2CH_2Cl + CH_3CH_2CH(Cl)CH_3$

(b) By electrophilic substitution

$\text{Benzene} + X_2 \xrightarrow{Fe, Dark} \text{Benzene-X} + HX$

(c) Sandmeyer's reaction

$\text{Benzene-NH}_2 \xrightarrow{NaNO_2 + HX, 273-278K} \text{Benzene-N} \xrightarrow{Cu_2X_2} \text{Benzene-X} + N_2$

(d) From alkenes

$C=C + HX \rightarrow C-C$

$H_2C=CH_2 + Br_2 \xrightarrow{CCl_4} BrCH_2-CH_2Br$

Halo exchange :

$R-X + NaI \rightarrow R-I + NaX$

=>Properties

- Physical : Colourless, volatile, sweet smell.
- Lower members are gases at room temperature while higher are solids.
- B.P : $RI > RBr > RCl > RF$
- M.P : Para isomers have high m.p. than ortho and meta-isomers.
- Density : Increases with increase in number of C/X atoms and atomic masses of the X atoms.
- Solubility : Very slightly soluble in water.

Chemical :

(a) Nucleophilic substitution

$Nu^- + \text{C-X} \rightarrow \text{C-Nu} + X^-$

For S_N2 reaction

tertiary, Secondary, Primary

For S_N1 reaction

(b) Elimination reaction

$B^- + \text{C-X} \rightarrow \text{C=C} + B-H + X^-$

B = Base; X = Leaving group

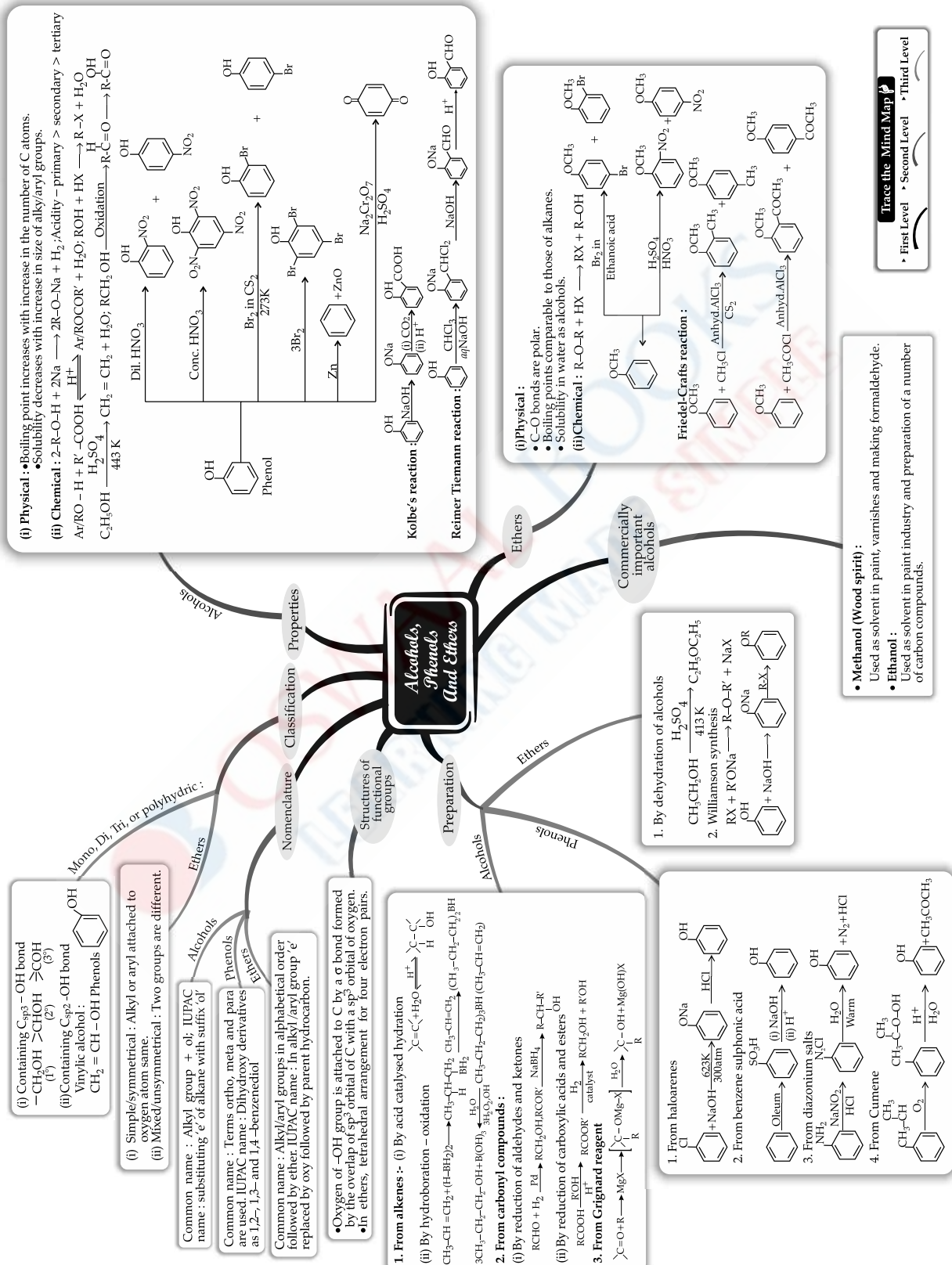
(c) Reaction with metals

$CH_3CH_2Br + Mg \rightarrow CH_3CH_2MgBr$

Wurtz reaction : $2RX + 2Na \xrightarrow{Dry ether} RR + 2NaX$

Trace the Mind Map

- First Level
- Second Level
- Third Level



ALDEHYDES AND KETONES:

(i) Physical: Boiling points are higher than hydrocarbons and ethers of comparable molecular masses.
 Aldehydes are more reactive than ketones due to steric and electronic reasons.

(ii) Chemical: **Nucleophilic addition reactions:**

$$\text{R}_2\text{C}=\text{O} + \text{CN}^- + \text{H}_2\text{O}^+ \rightleftharpoons \text{R}_2\text{C}(\text{OH})(\text{CN})$$

$$\text{R}_2\text{C}=\text{O} + \text{HCl} \xrightarrow{\text{DIH}} \text{R}_2\text{C}(\text{OH})(\text{Cl})$$

$$\text{R}_2\text{C}=\text{O} + \text{H}_2\text{O} \xrightarrow{\text{DIH}} \text{R}_2\text{C}(\text{OH})_2$$

Reduction: (a) To alcohols – aldehydes and ketones reduce to primary and secondary alcohols respectively by NaBH_4 or LiAlH_4 .
 (b) To hydrocarbons –

$$\text{C}=\text{O} \xrightarrow{\text{Zn-Hg, HCl}} \text{C-H} + \text{H}_2\text{O} \text{ (Clemmensen Reduction)}$$

$$\text{C}=\text{O} \xrightarrow{\text{NH}_3, \text{NH}_2} \text{C}=\text{NNH}_2 \xrightarrow{\text{KOH/Ethylene glycol, Heat}} \text{C}_2\text{H}_2 + \text{N}_2 \text{ (Wolf-Kishner)}$$

Oxidation: $\text{RCHO} \xrightarrow{[\text{O}]} \text{RCOOH}$ Silver mirror
Tollens' test: $\text{RCHO} + 2[\text{Ag}(\text{NH}_3)_2]^+ + 3\text{OH}^- \rightarrow \text{RCOO}^- + 2\text{Ag}\downarrow + 2\text{H}_2\text{O} + 4\text{NH}_3$
Fehling's test: $\text{RCHO} + 2\text{Cu}^{2+} + 5\text{OH}^- \rightarrow \text{RCOO}^- + \text{Cu}_2\text{O}\downarrow + 3\text{H}_2\text{O}$
Red brown ppt

Haloforn reaction:
 $\text{R}-\text{C}(=\text{O})-\text{CH}_3 \xrightarrow{\text{NaOX}} \text{R}-\text{C}(\text{O})-\text{ONa} + \text{CHX}_3$

Reactions due to α -hydrogen:

$$2\text{CH}_3\text{CHO} \xrightarrow{\text{dilNaOH}} \text{HO}-\text{CH}(\text{OH})-\text{CH}_2-\text{C}(=\text{O})-\text{H} + \text{H}_2\text{O} \xrightarrow{\Delta} \text{CH}_3-\text{CH}=\text{CH}-\text{CHO}$$

$$2\text{CH}_3\text{COCH}_3 \xrightarrow{\text{Ba}(\text{OH})_2} \text{HO}-\text{C}(\text{CH}_3)_2-\text{C}(=\text{O})-\text{CH}_3 + \text{H}_2\text{O} \xrightarrow{\Delta} \text{CH}_3-\text{C}(\text{CH}_3)=\text{CH}-\text{CO}-\text{CH}_3$$

$$\text{CH}_3\text{CHO} \xrightarrow{\text{NaOH}} \text{CH}_3-\text{CH}=\text{CH}-\text{CHO} + \text{CH}_3-\text{CH}_2-\text{CH}=\text{C}(\text{CH}_3)-\text{CHO}$$

Cannizzaro reaction: $2\text{HCHO} + \text{conc KOH} \xrightarrow{\Delta} \text{CH}_3\text{OH} + \text{HCOOK}$

Electrophilic substitution reaction:

$$\text{CHO} \xrightarrow{\text{HNO}_3/\text{H}_2\text{SO}_4, 273-283 \text{ K}} \text{NO}_2\text{CHO}$$

Carboxylic acids:

(i) Physical: Higher boiling points than aldehydes, ketones or alcohols.
 Solubility decreases with increasing number of C atoms

(ii) Chemical: $2\text{RCOOH} + 2\text{Na} \rightarrow 2\text{RCOONa} + \text{H}_2$

Forms corresponding anhydride on heating with mineral acids

$$\text{RCOOH} + \text{R}'\text{OH} \xrightarrow{\text{H}^+} \text{RCOOR}' + \text{H}_2\text{O}$$

$$\text{RCOOH} + \text{PCl}_5 \rightarrow \text{RCOCl} + \text{POCl}_3 + \text{HCl}$$

$$\text{CH}_3\text{COOH} + \text{NH}_3 \rightleftharpoons \text{CH}_3\text{COONH}_4 \xrightarrow{\Delta} \text{CH}_3\text{CONH}_2 + \text{H}_2\text{O}$$

$$\text{RCOOH} \xrightarrow{\text{B}_2\text{H}_6} \text{RCH}_2\text{OH}$$

$$\text{RCOONa} \xrightarrow{\text{Heat}} \text{R-H} + \text{Na}_2\text{CO}_3$$

$$\text{RC}_2\text{H}_2\text{COOH} \xrightarrow[\text{X/Red P}]{\text{H}_2\text{O}} \text{R}-\text{CH}(\text{COOH})-\text{R} \text{ (HVZ reaction)}$$

ALDEHYDES:

1. From acyl chloride

$$\text{R}-\text{C}(=\text{O})-\text{Cl} \xrightarrow{\text{H}_2, \text{Pd-BaSO}_4} \text{R}-\text{CHO}$$

2. From nitriles and esters: **Stephen reaction**
 $\text{RCN} + \text{SnCl}_2 + \text{HCl} \rightarrow \text{RCH}=\text{NH} \xrightarrow{\text{H}_3\text{O}^+} \text{RCHO}$

3. From hydrocarbons: **Etard reaction**
 $\text{C}_6\text{H}_5\text{CH}_3 + \text{CrO}_2\text{Cl}_2 \xrightarrow{\text{CS}_2} \text{C}_6\text{H}_5\text{CH}(\text{O}^-\text{Cr}(\text{O}^-\text{H})\text{Cl}_2) \xrightarrow{\text{H}_3\text{O}^+} \text{C}_6\text{H}_5\text{CHO}$

Gattermann-Koch reaction
 $\text{C}_6\text{H}_5\text{CHO} \xrightarrow[\text{Anhyd. AlCl}_3]{\text{CO, HCl}} \text{C}_6\text{H}_5\text{C}(\text{OH})\text{CHO}$

KETONES:

1. From acyl chloride
 $2\text{R}-\text{C}(=\text{O})-\text{Cl} + \text{CdCl}_2 \rightarrow \text{R}_2\text{C}=\text{O} + 2\text{Mg}(\text{X})\text{Cl}$

2. From nitriles
 $\text{CH}_3\text{CH}_2\text{CN} + \text{C}_6\text{H}_5\text{MgBr} \xrightarrow{\text{Ether}} \text{CH}_3\text{CH}_2-\text{C}(\text{C}_6\text{H}_5)_2 \xrightarrow{\text{H}_3\text{O}^+} \text{C}_6\text{H}_5\text{C}(\text{C}_6\text{H}_5)\text{CHO}$

3. From benzene or substituted benzenes
 $\text{C}_6\text{H}_5\text{COCl} + \text{Ar/R} \xrightarrow{\text{Anhyd. AlCl}_3} \text{Ar/R}-\text{C}(=\text{O})-\text{C}_6\text{H}_5$

Carboxylic Acids:

1. From primary alcohols and aldehydes $\text{RCH}_2\text{OH} \xrightarrow{\text{alk. KMnO}_4} \text{RCOOH}$

2. From alkylbenzenes $\text{C}_6\text{H}_5\text{CH}_3 \xrightarrow{\text{KMnO}_4/\text{KOH}} \text{C}_6\text{H}_5\text{COOH}$

3. From nitriles and amides $\text{R-CN} \xrightarrow{\text{H}^+/\text{OH}^-} \text{R-C(=O)-NH}_2 \xrightarrow{\text{H}^+/\text{OH}^-} \text{RCOOH}$

4. From Grignard reagents $\text{R-Mg-X} + \text{CO}_2 \rightarrow \text{R}-\text{C}(=\text{O})-\text{OMgX} \xrightarrow{\text{H}_3\text{O}^+} \text{RCOOH}$

5. From acyl halides and anhydrides
 $\text{RCOCl} \xrightarrow{\text{OH}^-/\text{H}_2\text{O}} \text{RCOO}^- + \text{Cl}^- \xrightarrow{\text{H}_3\text{O}^+} \text{RCOOH}$

6. From esters
 $\text{C}_6\text{H}_5\text{COOCOC}_6\text{H}_5 \xrightarrow{\text{H}_2\text{O}} \text{C}_6\text{H}_5\text{COOH} + \text{C}_6\text{H}_5\text{COOH}$
 $\text{C}_6\text{H}_5\text{COOCOC}_6\text{H}_5 \xrightarrow{\text{NaOH}} \text{C}_6\text{H}_5\text{COONa} + \text{C}_6\text{H}_5\text{COONa} \xrightarrow{\text{H}_3\text{O}^+} \text{C}_6\text{H}_5\text{COOH} + \text{C}_6\text{H}_5\text{COOH}$

Aldehydes, Ketones and Carboxylic Acids

Preparation

Properties

Nomenclature and uses

1. **Aldehydes and Ketones**

- Common names:
 - Replace corresponding carboxylic acids with aldehyde.
 - Alkyl phenyl ketones by adding acyl group as prefix to phenone.
- IUPAC names:
 - Replacing -e with -al and -one as required.
- Structure of Carbonyl group
- sp^2

2. **Carboxylic Acids**

- Common names: end with -ic
- IUPAC names: replace -e in the corresponding alkane with -oic acid.
- Structure of Carboxyl Group
- sp^2

3. **USES**

(a) **Carboxylic acids**

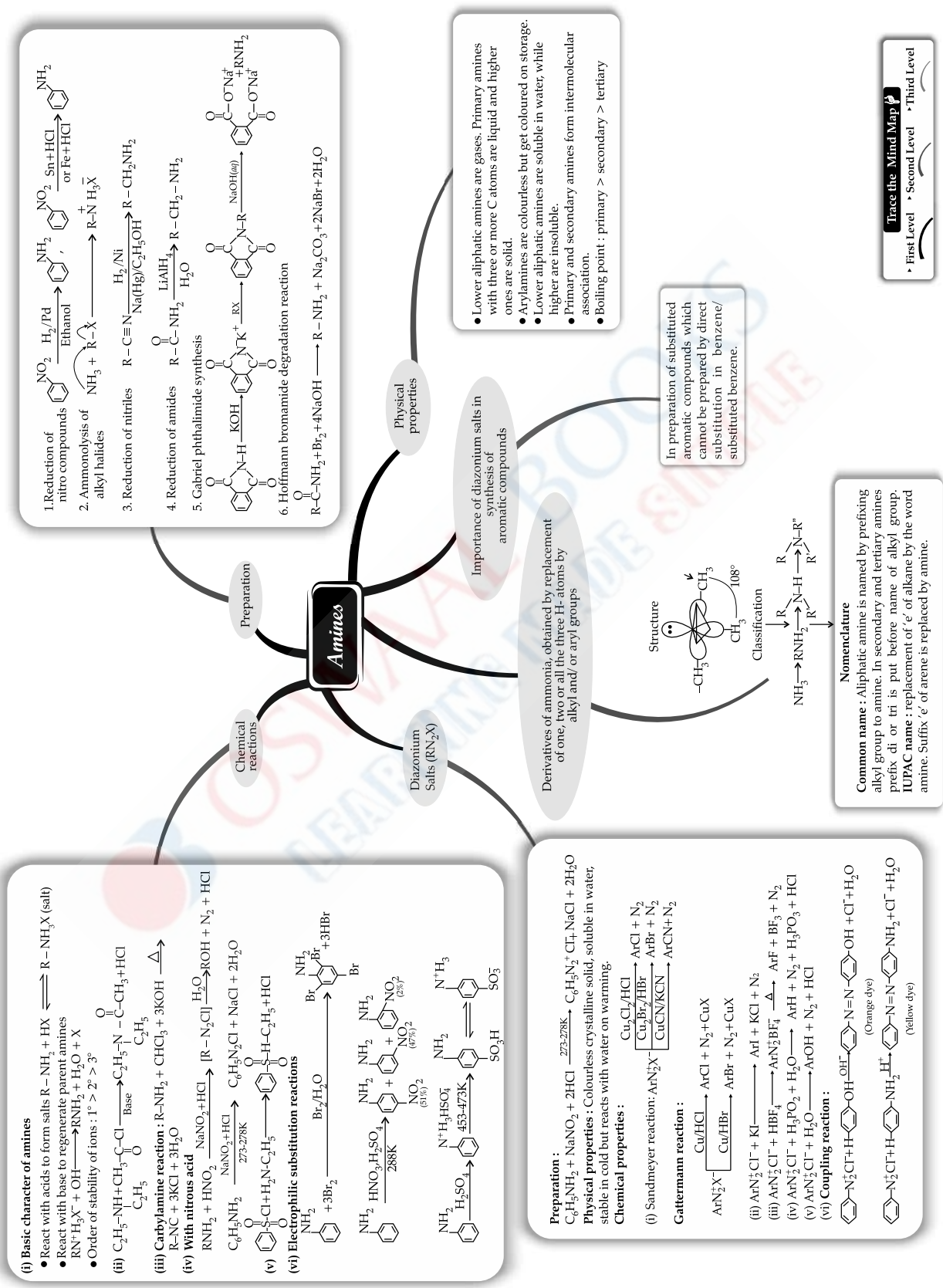
- Methanoic acid in rubber, textile, dyeing, leather industries.
- Ethanoic acid as solvent
- Higher fatty acids in manufacture of soaps and detergents.

(b) **Aldehydes of ketones**

- As solvents.
- Starting materials and reagents for synthesis of products.

Trace the Mind Map

- First Level
- Second Level
- Third Level

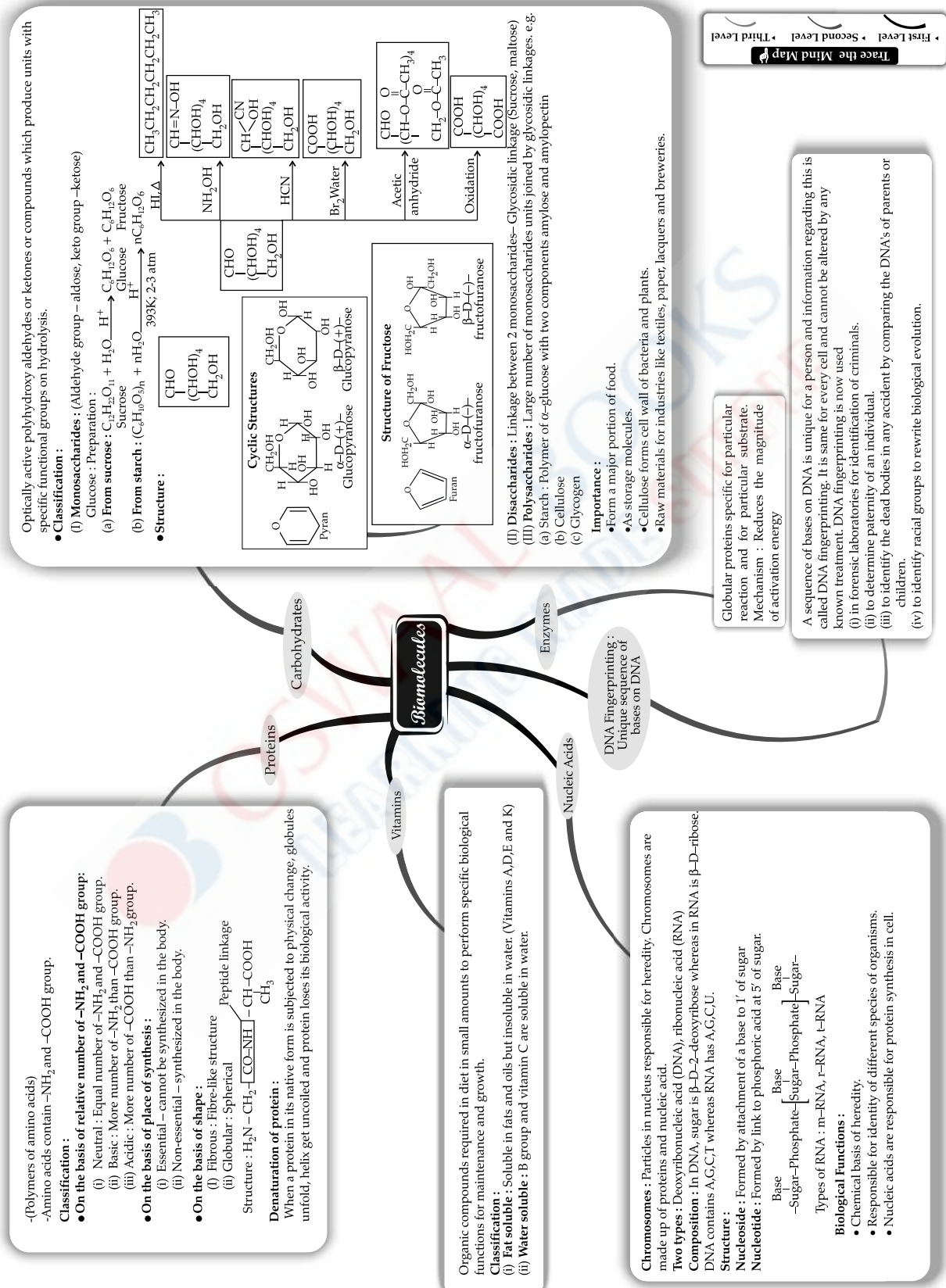


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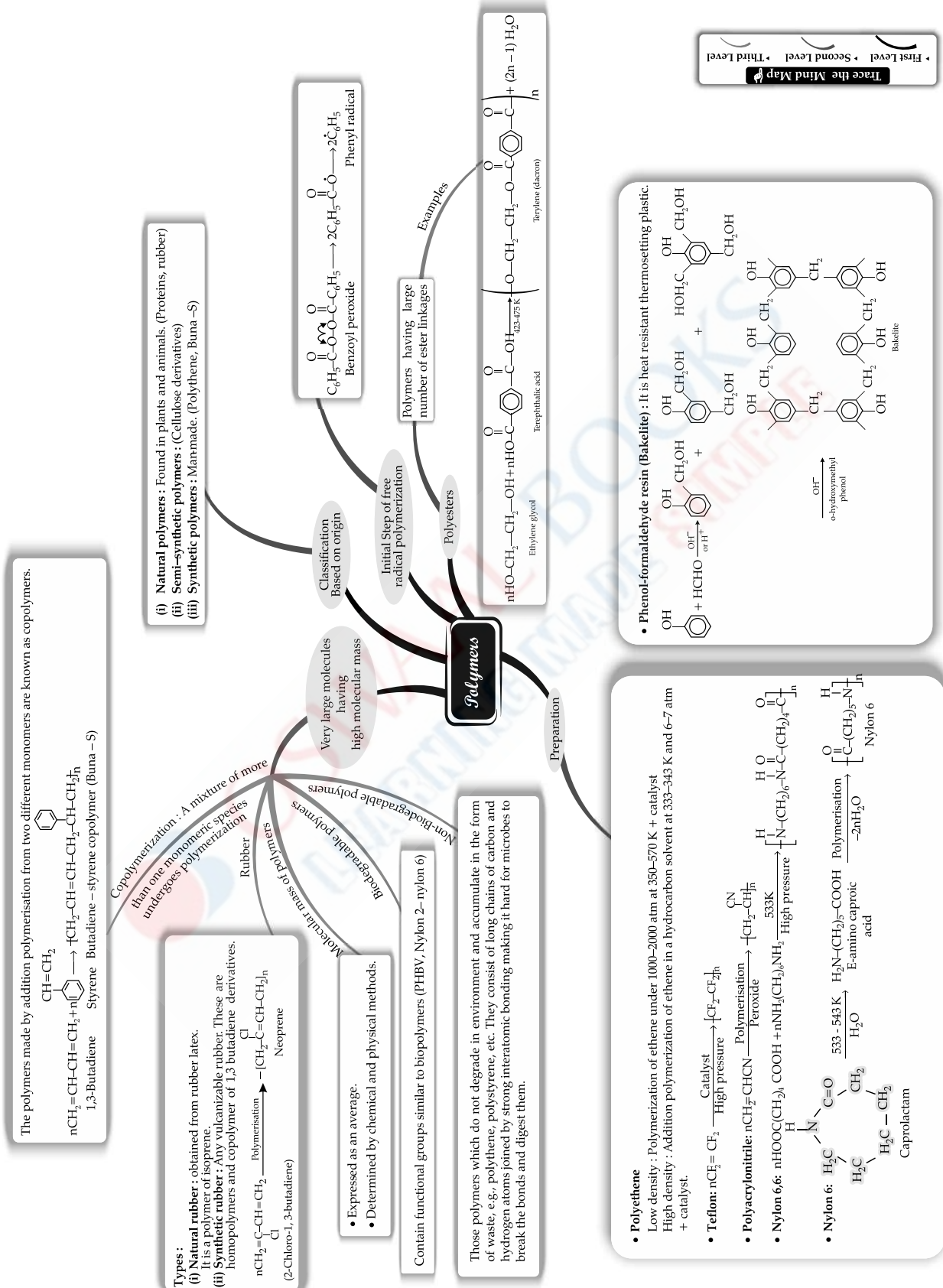
- First Level
- Second Level
- Third Level

Common name: Aliphatic amine is named by prefixing alkyl group to amine. In secondary and tertiary amines prefix di or tri is put before name of alkyl group.

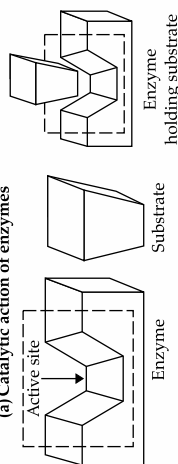
IUPAC name: replacement of 'e' of alkane by the word amine. Suffix 'e' of arene is replaced by amine.



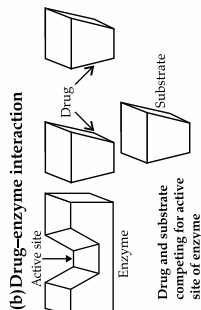
Trace the Mind Map
 • First Level • Second Level • Third Level



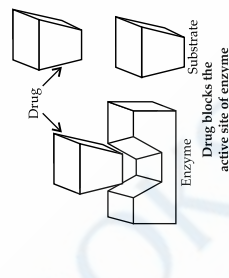
- Drugs are chemicals of low molecular masses. Interact with macromolecular targets to produce a biological response.
- **Classification of drugs:**
 - (a) **On the basis of pharmacological effect :** Provides range of drugs available for a particular type of problem. (Analgesics, Antisepsics).
 - (b) **On the basis of drug action :** (Antihistamines inhibit action of histamine responsible for causing inflammation in the body.
 - (c) **On the basis of chemical structure :** Common structural features. (Sulphonamides)
 - (d) **On the basis of molecular targets :** Most useful.
- **Drugs-target Interaction:**
 - (i) **Enzymes as Drug Targets**



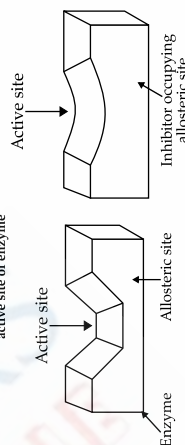
(a) Catalytic action of enzymes



(b) Drug-enzyme interaction



(c) Drug blocks the active site of enzyme



(d) Receptors as Drug Targets: Receptors are proteins crucial for body's communication and are embedded in cell membrane.

Chemistry in Everyday Life

Medicines: Chemicals which generate therapeutic and useful biological response

Therapeutic Action of Different Classes of Drugs

- **Antacids :** Substances that neutralize the excess HCl and raise pH in stomach (Ranitidine, Cimetidine).
- **Antihistamines :** Interfere with natural action of histamine by competing with histamine for binding sites of receptor where histamine exerts its effect.
- **Neurologically Active Drugs**
 - (a) **Tranquilizers :** Class of chemical compounds used for the treatment of stress and mild or even severe mental diseases. (Promiazid, Phenelzine)
 - (b) **Analgesics :** Reduce/abolish pain without causing impairment of consciousness, mental confusion, incoordination or paralysis or other disturbances of nervous system. These are classified as:
 - (i) Non-narcotic (non-addictive) : (Aspirin, Paracetamol)
 - (ii) Narcotic : (Morphine)
- **Antimicrobials**
 - (a) **Antibiotics :** Drugs to treat infections because of their low toxicity for humans and animals. (Prontosil)
 - (b) **Antiseptics and Disinfectants :** Chemicals which either kill or prevent the growth of microorganisms. Antiseptics are applied to living tissues whereas disinfectants are applied to inanimate objects.
- **Antifertility Drugs :** Birth control pills. (Norethindrone, ethinyl/estradiol)

Chemicals In Food

Purpose:

- For their preservation.
 - Enhancing their appeal.
 - Adding nutritive value.
- (a) **Artificial Sweetening Agents :** Natural sweeteners (sucrose), artificial sweeteners (Aspartame, Saccharin)
- (b) **Food Preservatives :** Prevent spoilage of food due to microbial growth. (Table salt, sugar)

Cleansing Agents

Detergents

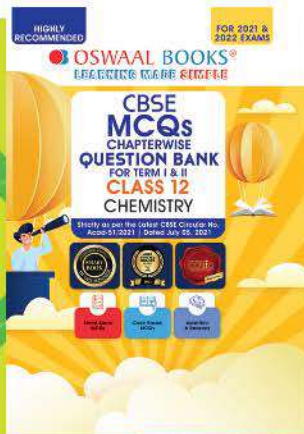
- (i) **Soap (Saponification)**
Glyceryl ester + Sodium hydroxide \rightarrow Sodium + Glycerol of stearic acid (fat) stearate
- (ii) **Synthetic Detergents :**
- **Anionic detergents :** Sodium salts of sulphonated long chain alcohols or hydrocarbons. (Sodium salts of alkyl benzene sulphonates)
 - **Cationic detergents :** Quaternary ammonium salts of amines with acetates, chlorides or bromides as anions. (Cetyltrimethylammonium bromide)
 - **Non-ionic Detergents :** Non-ionic type.

Trace the Mind Map

First Level \rightarrow Second Level \rightarrow Third Level

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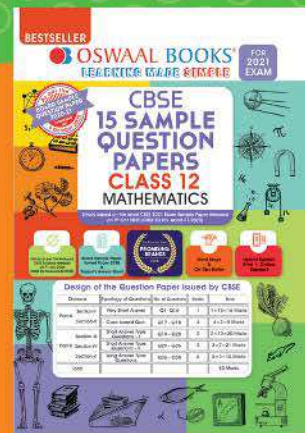
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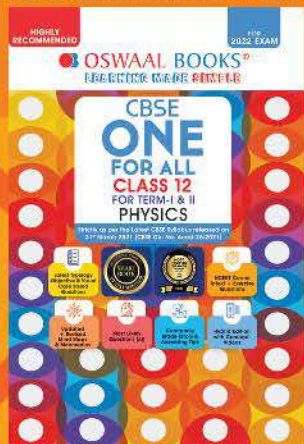
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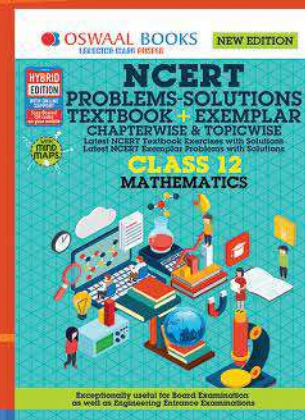
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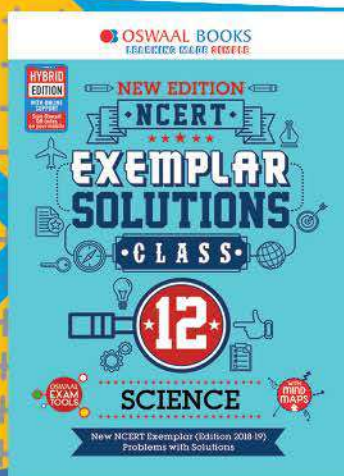
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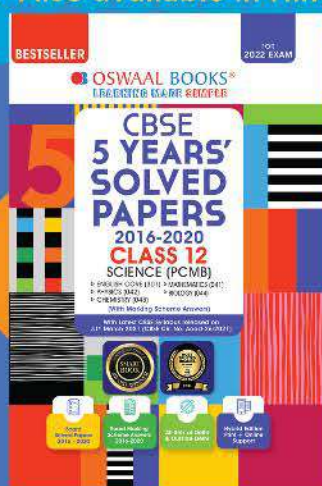
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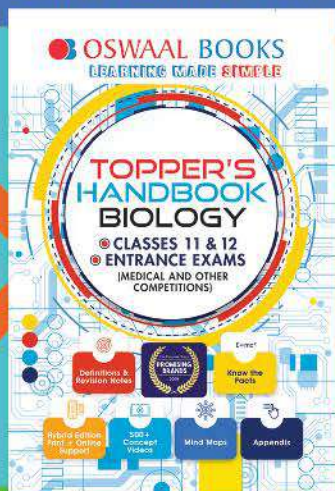
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