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Inspire Academy @ Pudukkottai - 622 001**PG -TRB – Chemistry****Concept map II (Organic chemistry)**

List of reagents to be used in organic synthesis/கரிம வேதி வினைகளில் பயன்படும் வினைப்பொருள்கள்

S.NO	REAGENTS/வினைப்பொருள்கள்	FUNCTIONAL GROUP TO BE CHANGED வினைபெறும் தொகுதியில் ஏற்படும் மாற்றம்	
		FROM	TO
01	Aqueous/ நீரேறிய KMnO ₄	CH ₃ -CH=CH ₂	CH ₃ -COOH
02	PCC(Pyridinium chlorochromate)	CH ₃ -CH=CH-CH ₂ -CH ₃ R-CH-(OH)-R	CH ₃ -CH=CH-CO-CH ₃ R-CO-R
03	m-ClC ₆ H ₄ CO ₃ H (meta chloro per benzoic acid)	Trans olefin Cis olefin	Trans epoxide (எப்பாக்லைடு) Cis epoxide
04	SeO ₂	CH ₂ =CH-C=O-CH ₃	CH ₂ =CH-CH ₂ -CH ₃
05	Pd/CaCO ₃ -Lindlar's catalyst	Alkyne	Cis-alkene
06	Na/Liq-NH ₃	Alkyne	Trans alkene
07	Cold alk KMnO ₄ /OsO ₄ in ether	Alkene	Cis product (syn addition)
08	H ₂ O ₂ , HCOOH, HCOOOH	Alkene	trans product (anti addition)
09	DIBAL-H/H ₂ O	Ester/cyanide	Aldehyde
10	CrO ₂ Cl ₂	Toluene	Benzaldehyde
11	DMSO (dimethyl sulfoxide)	RCH ₂ -X	RCHO
12	Dry ice (CO ₂) and H ₂ O	RMgX	Carboxylic acid

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Isomerism in coordination compounds/அணைவுச் சேர்மங்களில் மாற்றியம்

S.No	Complex Type/ அணைவினர் தன்மை	Example/ எடுத்துக் காட்டு	Possible Geometrical Isomers/எவை மாற்றியம்	Optically Active Isomers/ ஒளி சுழற்றும் மாற்றியம்
01	Ma ₄	[PtCl ₄] ²⁻	1	-----
02	Ma ₃ b	[PtCl ₃ Br] ²⁻	1	-----
03	Ma ₂ b ₂	[Pt(NH ₃) ₂ Br ₂]	2	-----
04	Ma ₂ bc	[PtF ₂ BrCl]	2	-----
05	Mabcd	[Pt(NH ₃)(Py)ClBr]	3	-----
06	Ma ₆	[Fe(H ₂ O) ₆] ²⁺	1	-----
07	Ma ₅ b	[Co(NH ₃) ₅ Cl] ²⁺	1	-----
08	Ma ₄ b ₂ Ma ₄ bc	[Co(NH ₃) ₄ Cl ₂] ⁺ [Co(NH ₃) ₄ (H ₂ O)Cl]	2 Cis & trans	Both are inactive
09	Ma ₃ b ₃	[IrCl ₃ (PMe ₃) ₃]	2 Facial (1,2,3)& Meridional (1,2,6)	Both are inactive
10	Ma ₃ bcd	[Co(NH ₃)(H ₂ O)ClBr] ²⁺	4	-----
11	Ma ₂ b ₂ c ₂	[Co(NH ₃) ₂ (H ₂ O) ₂ Cl ₂]	5 Cis 1, Trans 1, Meso 3	Cis only optically active
12	Ma ₂ b ₂ cd	[Co(NH ₃) ₂ (H ₂ O) ₂ ClBr]	6	-----
13	Ma ₂ b ₂ cde	[Co(NH ₃) ₂ (H ₂ O) ₂ ClBr]	6	-----
14	Mabcdef	[Pt(py)(NH ₃)(NO ₂)ClBrI]	15 (dl)=30 isomers	All are optically active
15	M(AA) ₃	[Co(en) ₃] ²⁺ [Cr(Ox) ₃] ³⁻ [Cr(EDTA)]	1	Optically active
16	M(AA) ₂ b ₂	[Co(en) ₂ Cl ₂]	3	Cis is optically active
17	M(AA) ₂ bc	[Co(en) ₂ (NH ₃)Cl]	3	Cis is only active
18	M(AA)b ₂ c ₂	[Co(en)(NH ₃) ₂ Cl ₂]	3	Cis is only active
19	M(AA)b ₂ cd	[Co(Ox)(NH ₃)(PMe ₃) ₂ Cl]	4	-----
20	M(AA)bcde	[Co(Ox)(PMe ₃)(H ₂ O)(NH ₃)Cl]	6	-----
21	M(AB) ₃	[Ni(DMG) ₃] ²⁺	2	Both are optically active

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PG -TRB – Chemistry**Concept map I (VSEPR theory)**

Steric Number ↓	Lone pair →	Zero lone pair	1 lone pair	2 lone pairs	3 lone pairs	4 lone pairs
2(sp hybridization)		Linear	-	-	-	
3(sp ² hybridization)		Trigonal planar	Angular (bent)	-	-	
4(sp ³ hybridization)		Tetrahedral	pyramidal	Angular	-	
5(sp ³ d hybridization)		Trigonal bipyramidal	See saw or distorted tetrahedral	T – shape	Linear	
6(sp ³ d ² hybridization)		Octahedral	Square Pyramidal	Square planar	T – shape	Linear
7(sp ³ d ³ hybridization)		Pentagonal bipyramidal	Pentagonal pyramidal	-	-	-

Problems for Practice:

1. BeH₂, BeCl₂, BH₂⁺, NO₂⁺, CO
2. AlCl₃, CH₃⁺, CO₃²⁻, NO₃⁻, NO₂⁻, SO₂
3. BH₄⁻, SnCl₃⁻, SeO₃²⁻, H₂O, Cl₂O, NH₂⁻
4. XeO₃F₂, PCl₅, SF₄, SF₂Cl₂, XeOF₂, ClF₃, BrF₃, XeF₂
5. SF₆, TeCl₆, XeO₆⁴⁻, XeO₂F₄, IF₅, XeF₅⁺, XeF₄
6. XeF₆, ICl₇, IF₆⁻, [XeF₅]⁻

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Test module I (Chemical Bonding and molecular structure)

- Among SF_4 , BF_4^- , XeF_4 and ICl_4^- the number of species having two lone pair of electrons according to VSEPR theory
a) 2 b) 3 c) 4 d) 0
- In the molecules H_2O , NH_3 and CH_4
a) the bond angles are same b) the bond distances are same
c) the hybridization are same d) the shapes are same
- The total number of lone pairs of electrons in I_3^-
a) 0 b) 3 c) 6 d) 9
- Which ones among CO_3^{2-} , SO_3 , XeO_3 and NO_3^- have planar structure?
a) CO_3^{2-} , SO_3 , and XeO_3 b) NO_3^- , SO_3 , and XeO_3
c) CO_3^{2-} , NO_3^- , and XeO_3 d) CO_3^{2-} , SO_3 , and NO_3^-
- The number of lone-pairs are identical in the pairs
a) XeF_4 , ClF_3 b) XeO_4 , ICl_4^- c) XeO_2F_2 , ICl_4^- d) XeO_4 , ClF_3
- According to VSEPR theory, the geometry (with lone pair) around the central iodine in I_3^+ and I_3^- ions respectively
a) tetrahedral and tetrahedral b) trigonal bipyramidal, trigonal bipyramidal
c) tetrahedral, trigonal bipyramidal d) tetrahedral, octahedral
- The structure of $SbPh_5$ and PPh_5 respectively are
a) trigonal bipyramidal, square pyramidal b) square pyramidal, trigonal bipyramidal
c) trigonal bipyramidal, trigonal bipyramidal d) square pyramidal, square pyramidal
- The correct non-linear and iso-structural pair is
a) SCl_2 , I_3^- b) SCl_2 , I_3^+ c) SCl_2 , ClF_2^- d) I_3^+ , ClF_2^-
- According to VSEPR theory, the molecule/ion having tetrahedral shape is
a) SF_4 b) SO_4^{2-} c) S_2Cl_2 d) SO_2Cl_2
- The molecule with highest number of lone pairs and has linear shape based on VSEPR theory
a) CO_2 b) I_3^- c) NO_2^- d) NO_2^+
- The NH_4^+ and SO_4^{2-} ions have
a) Square planar geometry b) Pyramidal geometry

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c) Tetrahedral geometry d) Triangular geometry

12. The geometry around the central atom in ClF_4^+ is

a) Square planar b) Square pyramidal c) Octahedral d) trigonal bipyramidal

13. The shape of the molecule XeO_2F_2

a) distorted tetrahedral b) square planar c) trigonal bipyramidal d) tetrahedral

14. The bond angle of Cl_2O is ..a) smaller than F_2O b) greater than that of H_2O

c) smaller than that of H_2O d) same as that of F_2O

15. The species which has a square planar structure is

a) BF_4^- b) FeCl_4^- c) SF_4 d) XeF_4

16. Which of the following species has two non-bonded electron pairs on the central atom?

a) TeCl_4 b) ClF_3 c) ICl_2 d) PCl_3

17. The xenon compounds that are isostructural with IBr_2^- and BrO_3^- respectively are

a) linear XeF_2 and pyramidal XeO_3 b) bent XeF_2 and pyramidal XeO_3

c) bent XeF_2 and pyramidal XeO_3 d) linear XeF_2 and tetrahedral XeO_3

18. The compound $(\text{SiH}_3)_3\text{N}$ is expected to be

a) pyramidal and more basic than $(\text{CH}_3)_3\text{N}$

b) planar and less basic than $(\text{CH}_3)_3\text{N}$

c) pyramidal and less basic than $(\text{CH}_3)_3\text{N}$

d) planar and more basic than $(\text{CH}_3)_3\text{N}$

19. The structures of O_3 and N_3^- are

a) linear and bent respectively b) both linear c) both bent d) bent and linear respectively

20. The predicted geometry of TeF_4 by VSEPR theory is

a) octahedral b) square planar c) tetrahedral d) trigonal bipyramidal