

Day-1. → One Shot



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# CLASSIFICATION OF ELEMENTS AND PERIODICITY IN PROPERTIES

1-2 g.

\* Easy.  
~~Diff.~~

Table 3.4 Notation for IUPAC Nomenclature of Elements

Digit	Name	Abbreviation
0	nil	n
1	un	u
2	bi	b
3	tri	t
4	quad	q
5	pent	p
6	hex	h
7	sept	s
8	oct	o
9	enn	e

1 2 3 → unbitrium. (Ubt)

~~Sg~~ → 106 → unnilhexium (Unh)

Q. IUPAC name of element with atomic no 119?



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Ununennium  
(Uue)

Q- Identify the incorrect match.

- (a) (B), (ii)
- (b) (C), (iii)
- (c) (D), (iv)
- (d) (A), (i)

(NEET 2020)

	Name		IUPAC official name
(A)	Unnilunium <i>101</i> ✓ (i)		Mendelevium
(B)	Unniltrium <i>103</i> ✓ (ii)		Lawrencium
(C)	Unnihexium <i>106</i> ✓ (iii)		Seaborgium
(D)	Unununium <i>111</i> (iv)		Darmstadtium $\rightarrow$ <i>100</i>

*Roentgenium*

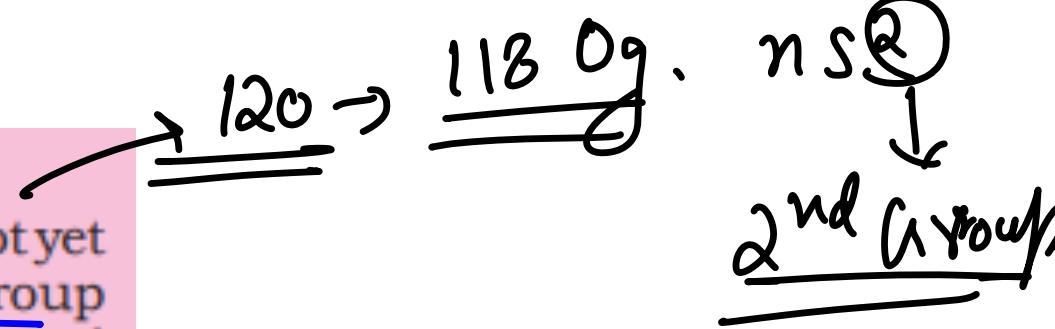


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### Problem 3.3

The elements Z= 117 and 120 have not yet been discovered. In which family/group would you place these elements and also give the electronic configuration in each case.  $118 \rightarrow \underline{\text{Gp 18.}}$



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$117 \rightarrow$   
H Halogen  $\rightarrow \underline{\text{Gp. 17}}$

$[\text{Rn}]_{86} = 5f^{14} 6d^{10} 7s^2 \underline{7p}^5$

p-Block :-

$$\begin{aligned} \text{Gp} &= 12 + p - e^- \\ &= 12 + 5 \\ &= 17 \end{aligned}$$

## HYDROGEN

Q- The element  $Z = 114$  has been discovered recently. It will belong to which of the following family/group and electronic configuration?



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(NEET 2017)

- (a) Halogen family, [Rn]  $5f^{14}6d^{10}7s^27p^5$  117  $\times$
- (b) Carbon family, [Rn]  $5f^{14}6d^{10}7s^27p^2$  114
- (c) Oxygen family, [Rn]  $5f^{14}6d^{10}7s^27p^4$  116  $\times$
- (d) Nitrogen family, [Rn]  $5f^{14}6d^{10}7s^27p^6$  118  $\times$

Q Group :-

- a)  $ns^2 np^5 \rightarrow 12 + 5 = 17$
  - b) Cu  $\rightarrow 3d^{10} 4s^1 \Rightarrow 10 + 1 = 11$
  - c) Gd  $\rightarrow$  Lanthanide
  - d) V  $\rightarrow$  Actinide
- $\left. \begin{matrix} \text{Lanthanide} \\ \text{Actinide} \end{matrix} \right\} f\text{-Block.}$  3

**Problem 3.4**

Considering the atomic number and position in the periodic table, arrange the following elements in the increasing order of metallic character : Si, Be, Mg, Na, P.

Be  
Na Mg Si P  
Na > Mg > Be > Si > P.

Q1 Which Block Contains metals, non-metals & metalloids ? p-Block



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Q2. Which Block contains Transuranic Element ?  
• Actinoids  $\rightarrow$  f-Block

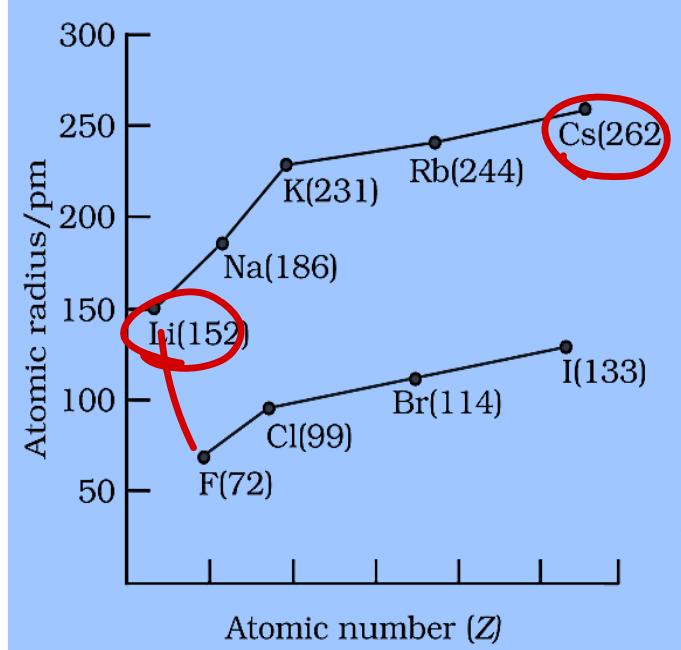
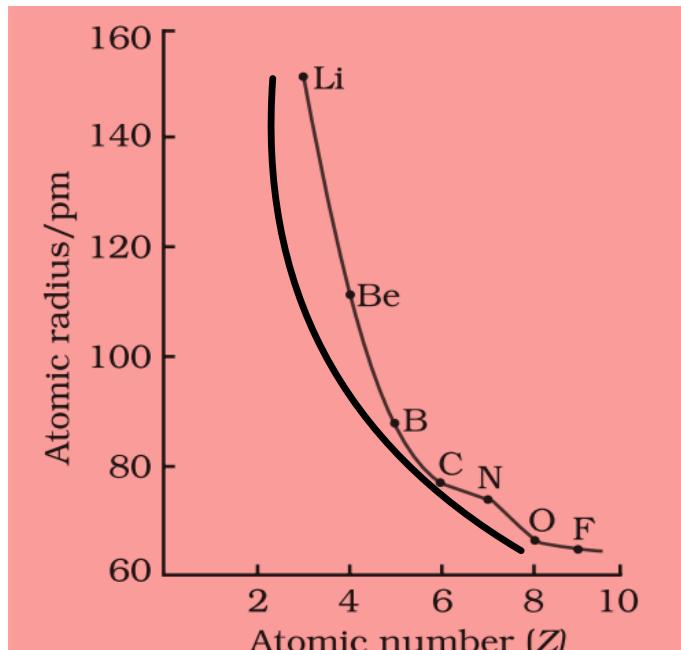
Table 3.6(a) Atomic Radii/pm Across the Periods

Atom (Period II)	Li	Be	B	C	N	O	F
Atomic radius	152	111	88	77	74	66	64
Atom (Period III)	Na	Mg	Al	Si	P	S	Cl
Atomic radius	186	160	143	117	110	104	99

Gp13:- B < Al < Ga < In < Tl.

~~XXX Table 3.6(b) Atomic Radii/pm Down a Family~~

Atom (Group I)	Atomic Radius	Atom (Group 17)	Atomic Radius
Li	152	F	64
Na	186	Cl	99
K	231	Br	114
Rb	244	I	133
Cs	262	At	140



Mg Al

**Problem 3.5**

Which of the following species will have the largest and the smallest size?  
Mg, Mg<sup>2+</sup>, Al, Al<sup>3+</sup>

~~Mg > Al > Mg<sup>2+</sup> > Al<sup>3+</sup>~~



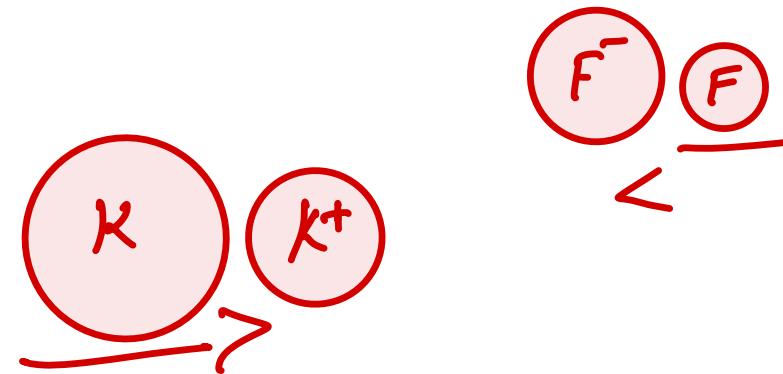
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Q.  $K^+ = F^- = 1.34 \text{ \AA}^\circ$

atomic radius of K = ? and F = ? , respectively. ( $\text{\AA}^\circ$ )

- a) 1.34, 1.34
- b) 0.72, 1.96
- c) 1.96, 0.72
- d) 1.96, 1.34.

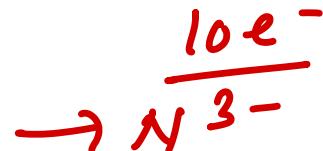


Q- The element expected to form largest ion to achieve  
the nearest noble gas configuration is



(NEET 2023)

(a) N



(b) Na



(c) O



(d) F



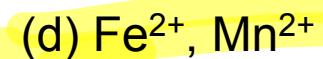
Q- From the following pairs of ion which one is not an iso-electronic pair?



$$A^{2+} \quad z_1 - 2e^- = x \quad (\text{NEET 2021})$$

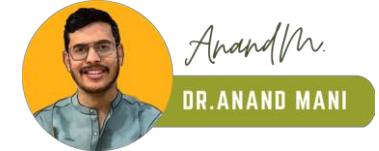


$$B^{2+} \quad z_2 - 2e^- = y.$$



$$\downarrow \quad \uparrow \\ 24e^- \quad 23e^-$$

2+  
Q- The species Ar, K<sup>+</sup> and Ca<sup>2+</sup> contain the same number of electrons. In which order do their radii increase?



(AIPMT 2015)

- (a) Ar < K<sup>+</sup> < Ca<sup>2+</sup>
- (b) Ca<sup>2+</sup> < Ar < K<sup>+</sup>
- (c) Ca<sup>2+</sup> < K<sup>+</sup> < Ar
- (d) K<sup>+</sup> < Ar < Ca<sup>2+</sup>

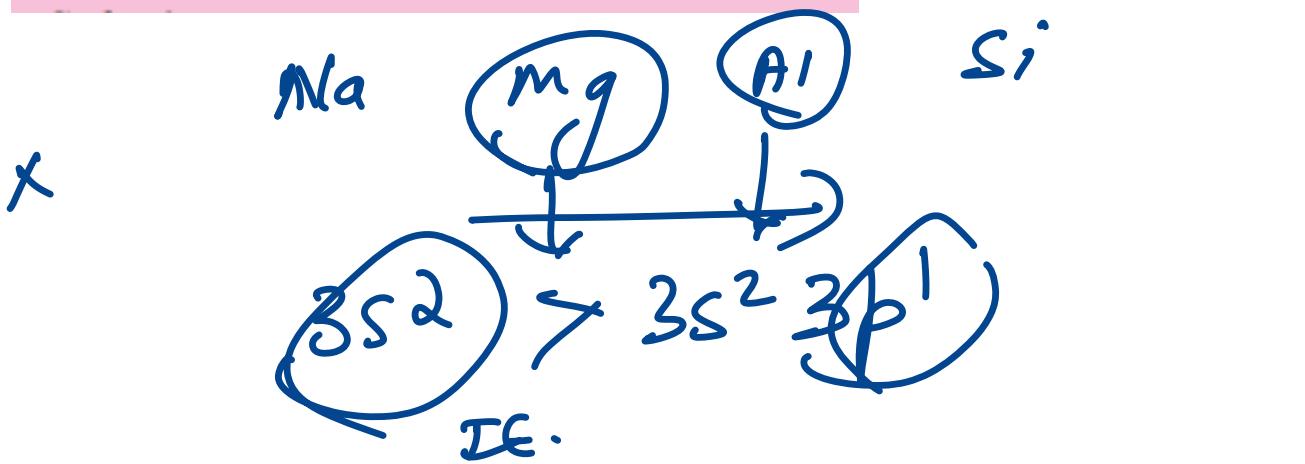
### Problem 3.6

The first ionization enthalpy ( $\Delta_i H$ ) values of the third period elements, Na, Mg and Si are respectively 496, 737 and 786 kJ mol<sup>-1</sup>. Predict whether the first  $\Delta_i H$  value for Al will be more close to 575 or 760 kJ mol<sup>-1</sup>? Justify your answer.



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Reason :- Penetration Effect

### Problem 3.7

Which of the following will have the most negative electron gain enthalpy and which the least negative?

P, S, Cl, F.

Explain your answer.

Note: In periodic table,

Cl has most negative EGE



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P      S      Cl

F

Cl > F > S > P.

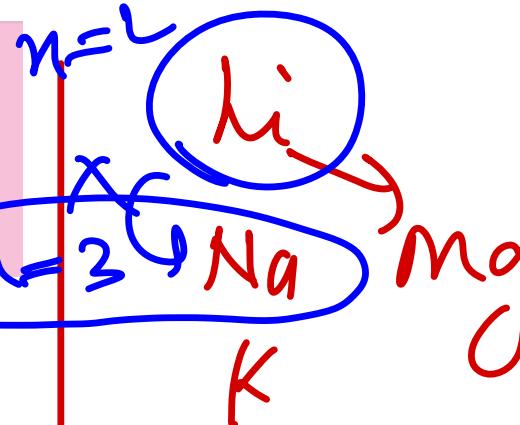
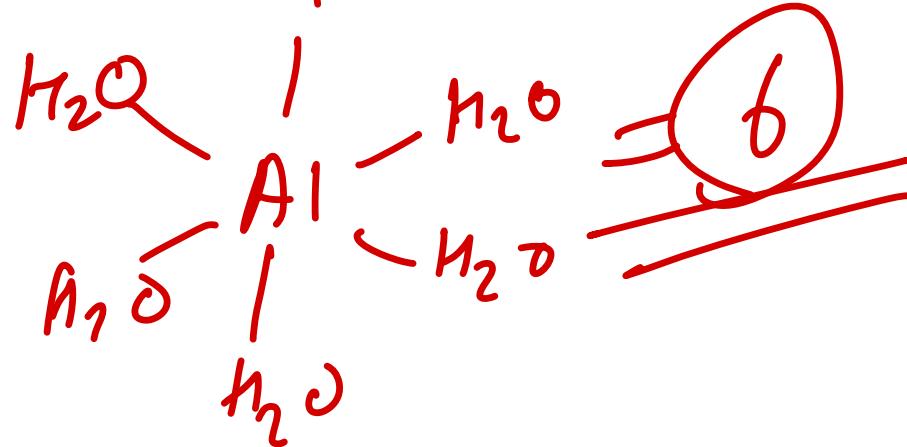
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### Problem 3.9

Are the oxidation state and covalency of Al in  $[\text{AlCl}(\text{H}_2\text{O})_5]^{2+}$  same?

$$\underline{x} + (-1) + 0 \times 5 = +2$$

$$\underline{x = +3}$$



3rd period Element

Group properties

“Typical Elements”



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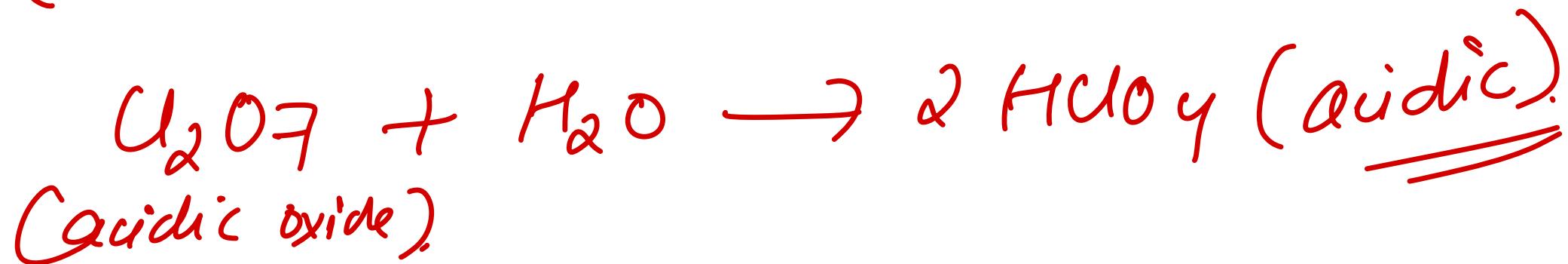
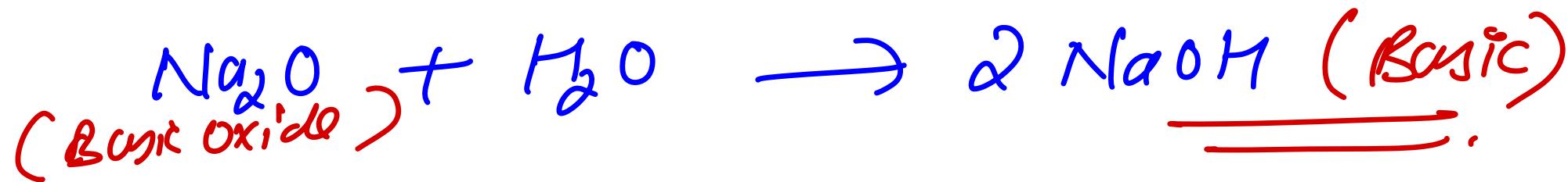
### Problem 3.10

Show by a chemical reaction with water that  $\text{Na}_2\text{O}$  is a basic oxide and  $\text{Cl}_2\text{O}_7$  is an acidic oxide.



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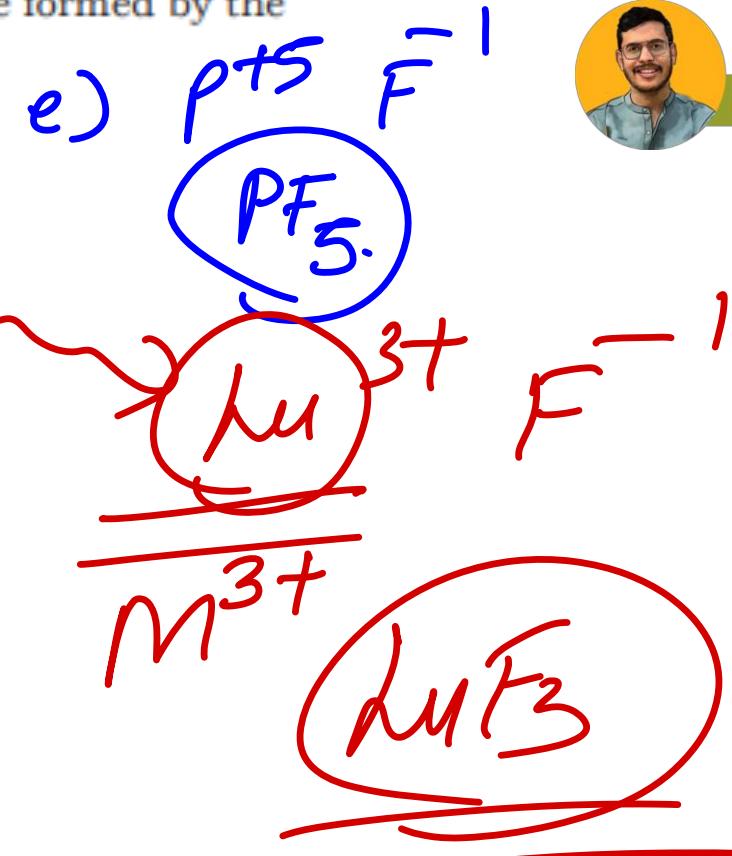
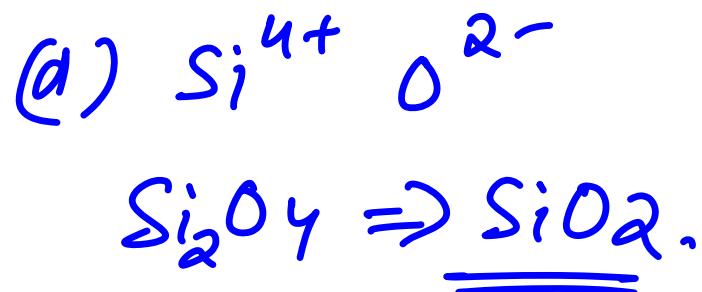
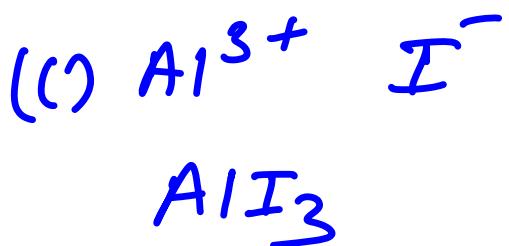
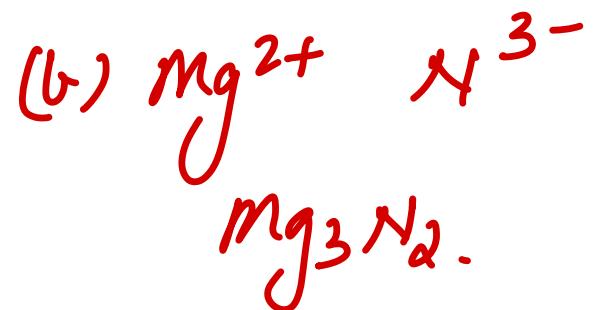
3.32 Predict the formulas of the stable binary compounds that would be formed by the combination of the following pairs of elements.

- (a) Lithium and oxygen      (b) Magnesium and nitrogen  
(c) Aluminium and iodine    (d) Silicon and oxygen  
(e) Phosphorus and fluorine   (f) Element 71 and fluorine



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3.33 In the modern periodic table, the period indicates the value of :

- (a) atomic number
- (b) atomic mass
- (c) principal quantum number
- (d) azimuthal quantum number.

(n).  
(shell)



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3.34 Which of the following statements related to the modern periodic table is incorrect?

- (a) The *p*-block has 6 columns, because a maximum of 6 electrons can occupy all the orbitals in a *p*-shell. *10 columns*
- (b) The *d*-block has 8 columns, because a maximum of 8 electrons can occupy all the orbitals in a *d*-subshell. *1 d 10.*
- (c) Each block contains a number of columns equal to the number of electrons that can occupy that subshell.
- (d) The block indicates value of azimuthal quantum number (*l*) for the last subshell that received electrons in building up the electronic configuration.



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3.35 Anything that influences the valence electrons will affect the chemistry of the element. Which one of the following factors does not affect the valence shell?

- (a) Valence principal quantum number ( $n$ ) ✓
- (b) Nuclear charge ( $Z$ ) ✓
- (c) Nuclear mass ✗
- (d) Number of core electrons. ✓



3.36 The size of isoelectronic species —  $\text{F}^-$ ,  $\text{Ne}$  and  $\text{Na}^+$  is affected by

- (a) nuclear charge ( $Z$ )
- (b) valence principal quantum number ( $n$ )
- (c) electron-electron interaction in the outer orbitals
- (d) none of the factors because their size is the same.



3.37 Which one of the following statements is incorrect in relation to ionization enthalpy?

- (a) Ionization enthalpy increases for each successive electron. ✓
- (b) The greatest increase in ionization enthalpy is experienced on removal of electron from core noble gas configuration. ✓
- (c) End of valence electrons is marked by a big jump in ionization enthalpy. ✓
- (d) Removal of electron from orbitals bearing lower  $n$  value is easier than from orbital having higher  $n$  value.



K mg

Al

3.38 Considering the elements B, Al, Mg, and K, the correct order of their metallic character is :

- (a) B > Al > Mg > K      (b) Al > Mg > B > K  
(c) Mg > Al > K > B      (d) K > Mg > Al > B

3.39 Considering the elements B, C, N, F, and Si, the correct order of their non-metallic character is :

- (a) B > C > Si > N > F      (b) Si > C > B > N > F  
(c) F > N > C > B > Si      (d) F > N > C > Si > B

3.40 Considering the elements F, Cl, O and N, the correct order of their chemical reactivity in terms of oxidizing property is :

- (a) F > Cl > O > N      (b) F > O > Cl > N  
(c) Cl > F > O > N      (d) O > F > N > Cl



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B < C < N < F  
Si

F > O > Cl > N.

# CHEMICAL BONDING AND MOLECULAR STRUCTURE



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## PART-1.

3-4 Q.  
↓

St. | Shape | Geometry.

→ Easy  
→ Basic.

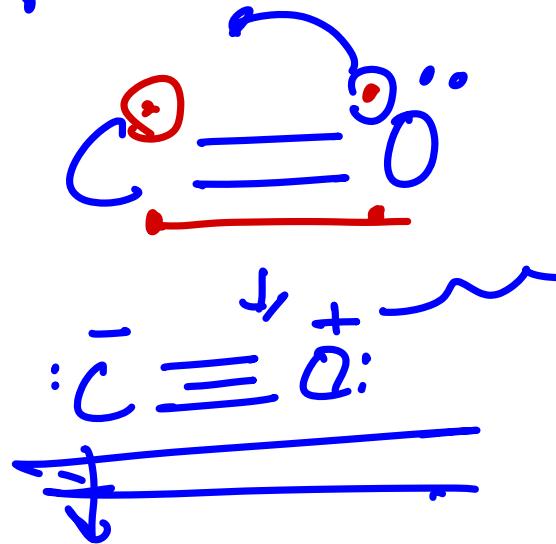
### Problem 4.1

Write the Lewis dot structure of CO molecule.



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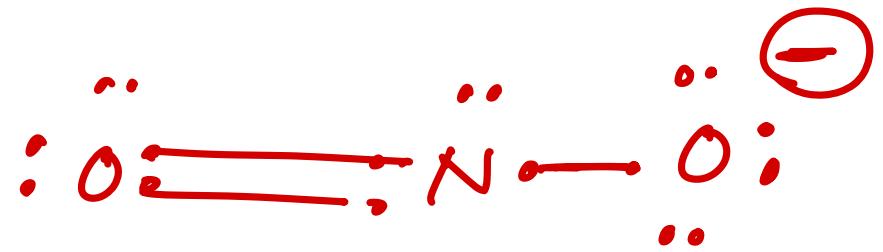
### Problem 4.2

Write the Lewis structure of the nitrite ion,  $\text{NO}_2^-$ .



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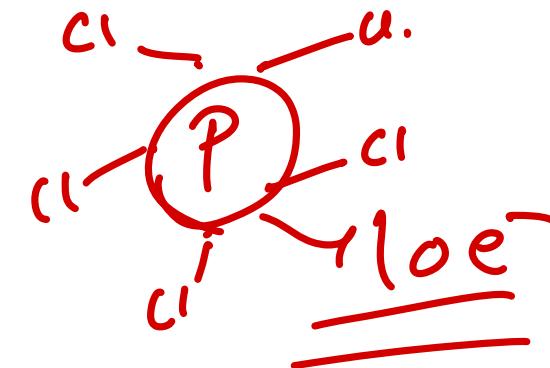
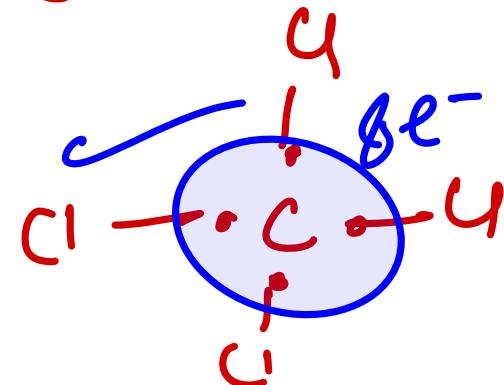
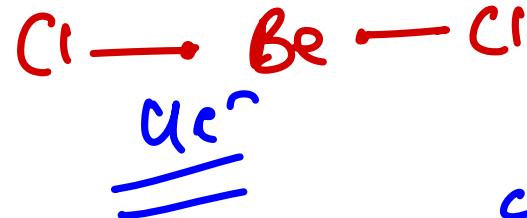
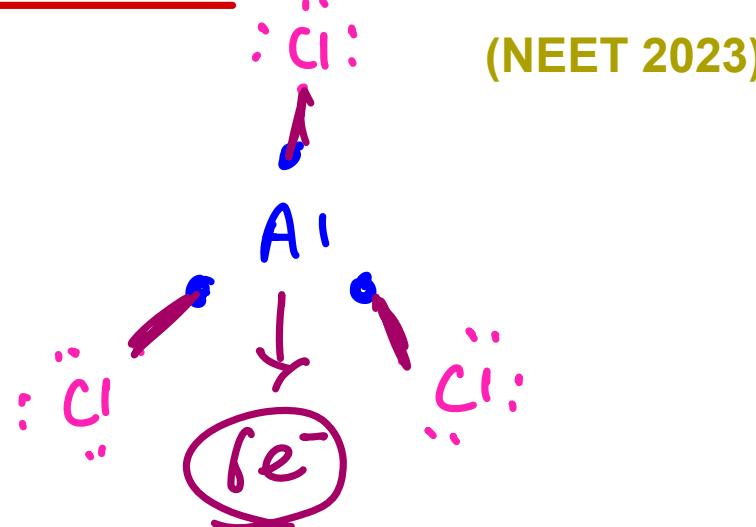
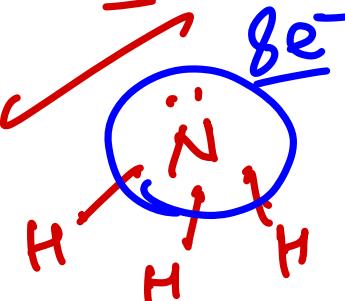
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Amongst the following the total number of species NOT having eight electrons around central atom in its outermost shell, is



- (a) 4
- (b) 1
- (c) 3
- (d) 2



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(NEET 2023)

The correct sequence of bond enthalpy of 'C - X' bond is

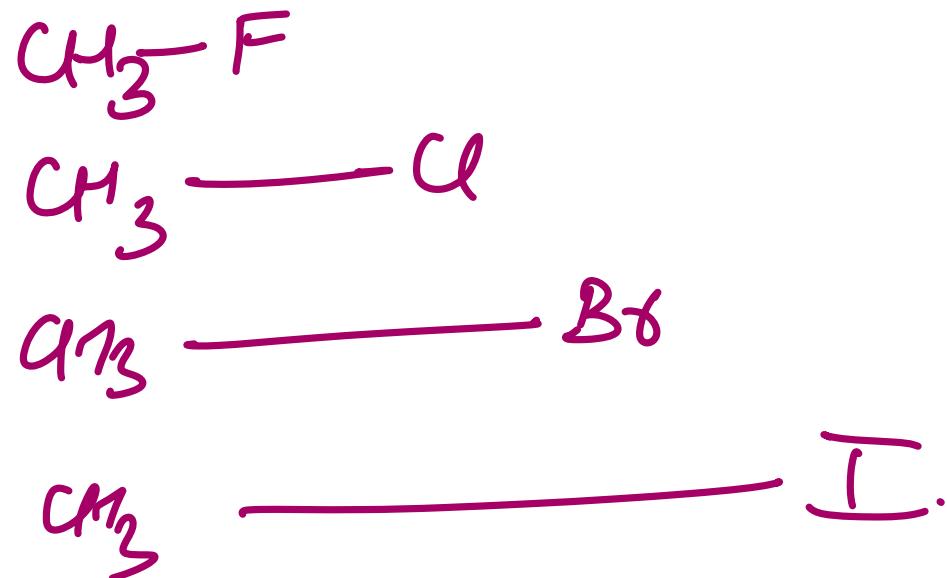
(NEET 2021)

- (a)  $\text{CH}_3 - \text{F} < \text{CH}_3 - \text{Cl} < \text{CH}_3 - \text{Br} < \text{CH}_3 - \text{I}$
- (b)  $\text{CH}_3 - \text{F} > \text{CH}_3 - \text{Cl} > \text{CH}_3 - \text{Br} > \text{CH}_3 - \text{I}$
- (c)  $\text{CH}_3 - \text{F} < \text{CH}_3 - \text{Cl} > \text{CH}_3 - \text{Br} > \text{CH}_3 - \text{I}$
- (d)  $\text{CH}_3 - \text{Cl} > \text{CH}_3 - \text{F} > \text{CH}_3 - \text{Br} < \text{CH}_3 - \text{I}$



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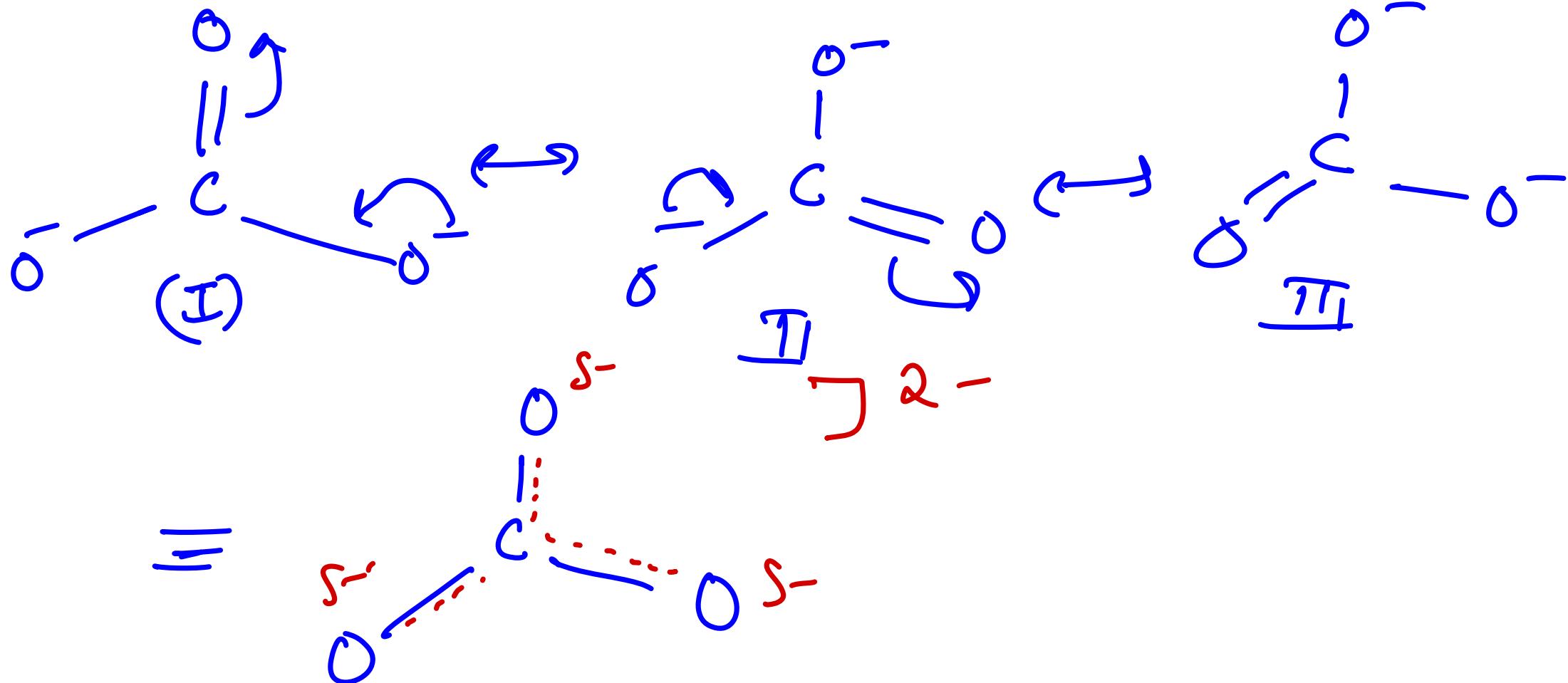
### Problem 4.3

Explain the structure of  $\text{CO}_3^{2-}$  ion in terms of resonance.



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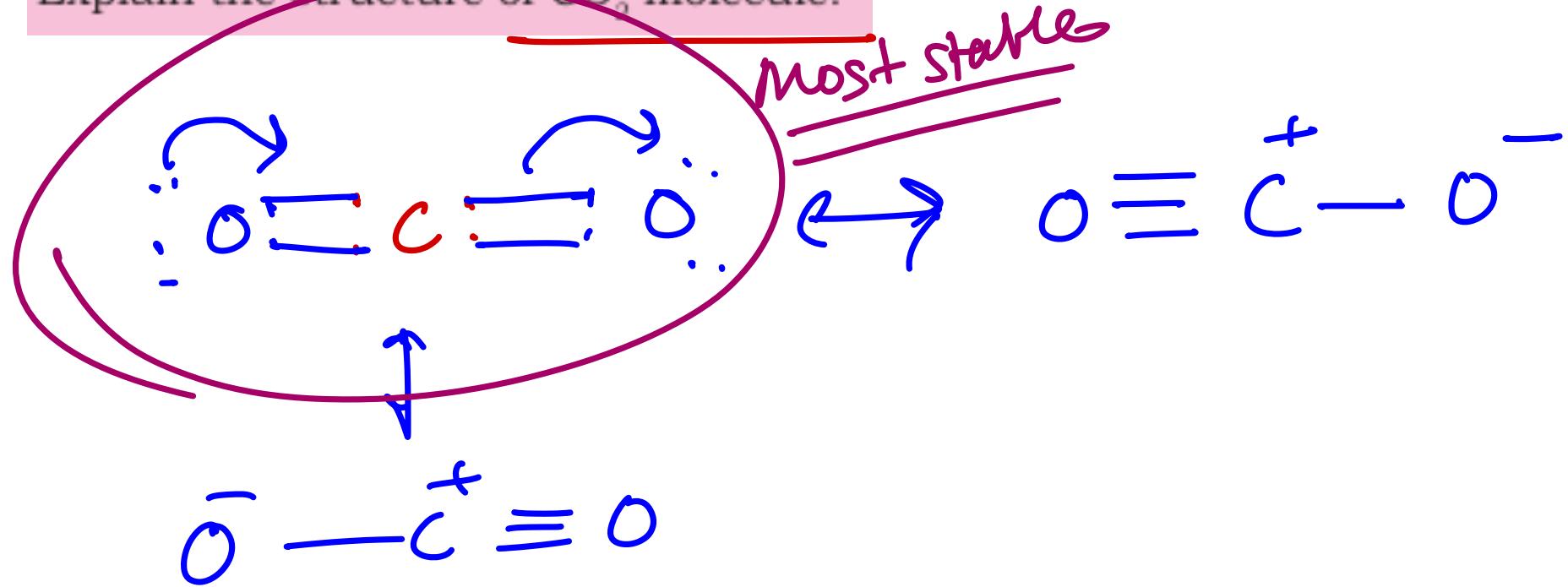
### Problem 4.4

Explain the structure of  $\text{CO}_2$  molecule.



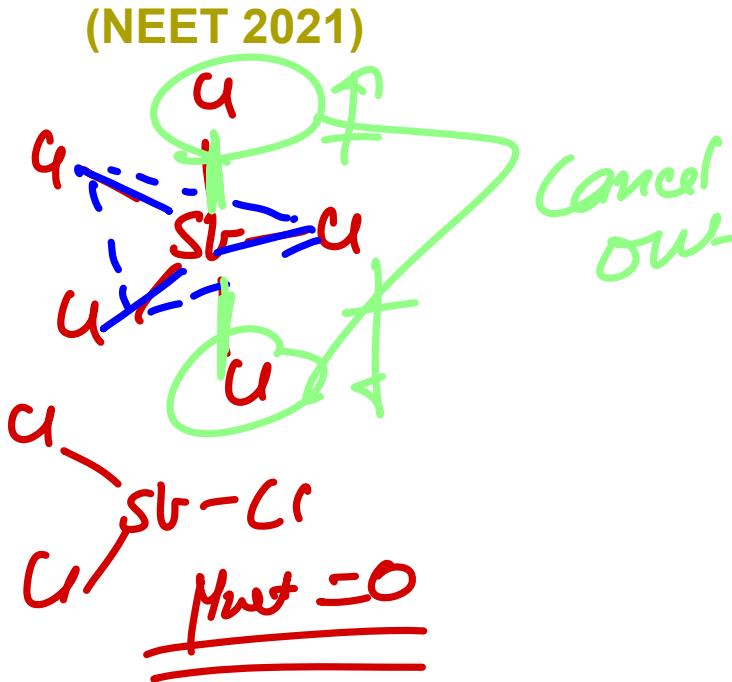
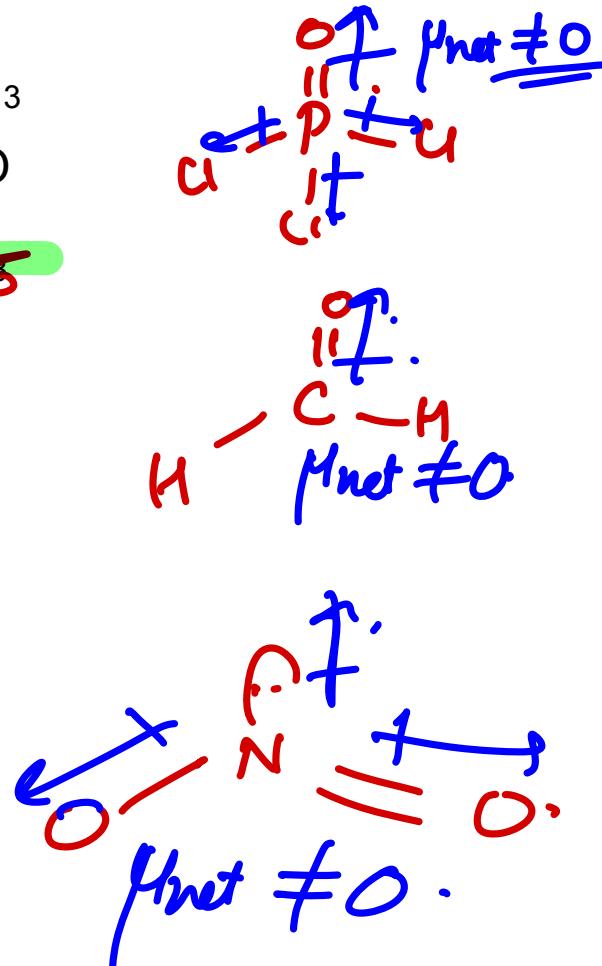
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Which of the following molecules is non-polar in nature?

- (a)  $\text{POCl}_3$
- (b)  $\text{CH}_2\text{O}$
- (c)  $\text{SbCl}_5$
- (d)  $\text{NO}_2$



Which of the following set of molecules will have zero dipole moment ?



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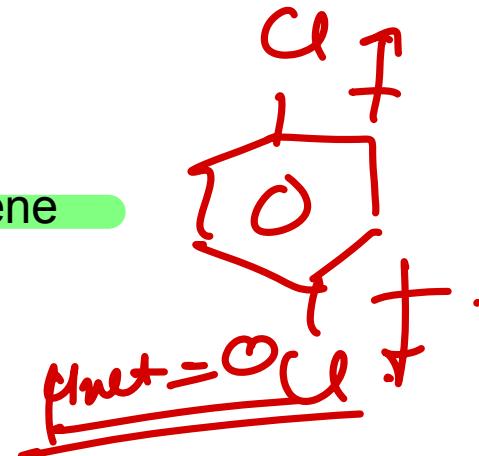
(NEET 2020)

(a) Boron trifluoride, hydrogen fluoride, carbon dioxide, 1, 3-dichlorobenzene

~~NF<sub>3</sub> X~~ (b) Nitrogen trifluoride, beryllium difluoride, water, 1, 3-dichlorobenzene

~~BF<sub>3</sub>~~ ~~BeF<sub>2</sub>~~ ~~CO<sub>2</sub>~~ (c) Boron trifluoride, beryllium difluoride, carbon dioxide, 1, 4-dichlorobenzene

(d) Ammonia, beryllium difluoride, water, 1, 4-dichlorobenzene

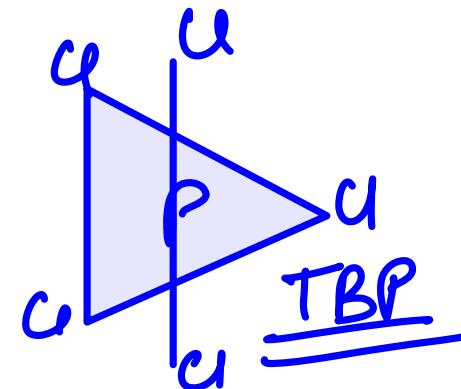


Identify the wrongly matched pair.



(NEET 2020)

- (a) Molecule- $\text{PCl}_5$ ; Shape of geometry of molecule-Trigonal planar
- (b) Molecule- $\text{SF}_6$ ; Shape of geometry of molecule-Octahedral
- (c) Molecule- $\text{BeCl}_2$ ; Shape of geometry of molecule-Linear
- (d) Molecule- $\text{NH}_3$ ; Shape of geometry of molecule-Trigonal pyramidal

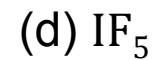
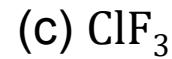


Amongst the following which one will have maximum 'lone pair - lone pair' electron repulsions?

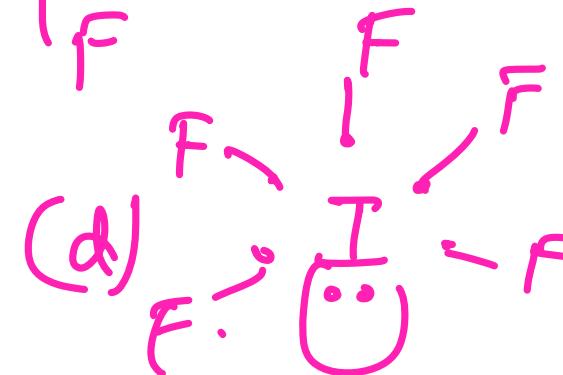
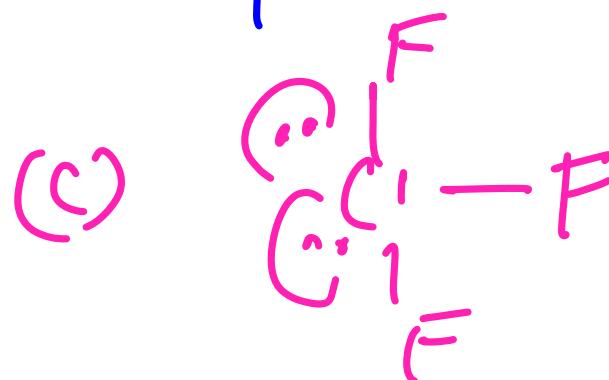
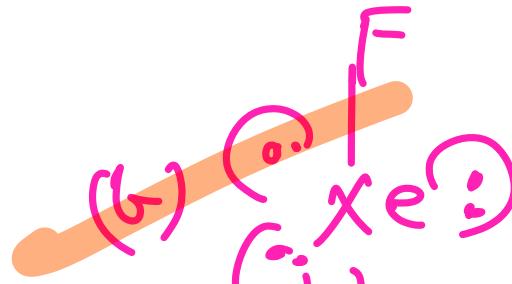
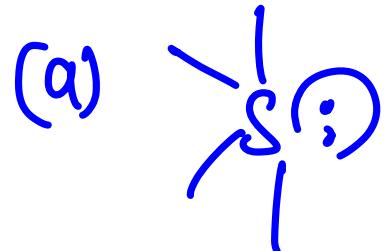


concept  
↓

(NEET 2022)



more no. of l.p.  $\Rightarrow$  l.p. - l.p. repulsion will be more.



Match List-I with List-II.

Choose the correct answer from the options given below



(NEET 2021)

- (a) A-IV, B-III, C-I, D-II
- (b) A-II, B-III, C-IV, D-I ✗
- (c) A-III, B-I, C-IV, D-II ✗
- (d) A-IV, B-III, C-II, D-I

	List-I		List-II
A.	PCl <sub>5</sub>	I.	Square pyramidal
B.	SF <sub>6</sub>	II.	Trigonal planar
C.	BrF <sub>5</sub>	III.	Octahedral
D.	BF <sub>3</sub>	IV.	Trigonal bipyramidal

~~O~~

The potential energy (y) curve for H formation as a function of internuclear distance (x) of the H-atoms is shown below.

The bond energy of H is



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(NEET 2020)

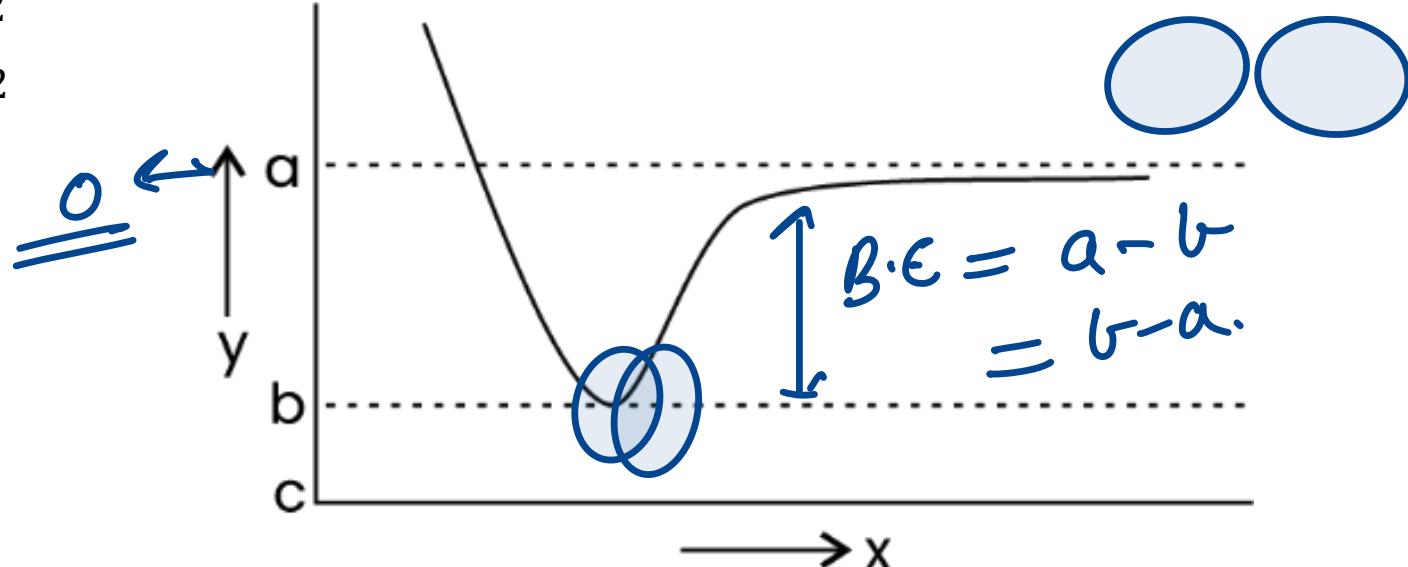
$$|b-a|$$

(a)  $(b - a)$

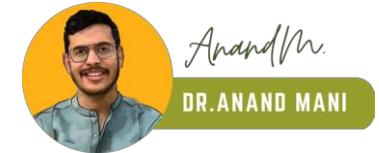
(b)  $(c-a)/2$

(c)  $(b-a)/2$

(d)  $(c - a)$

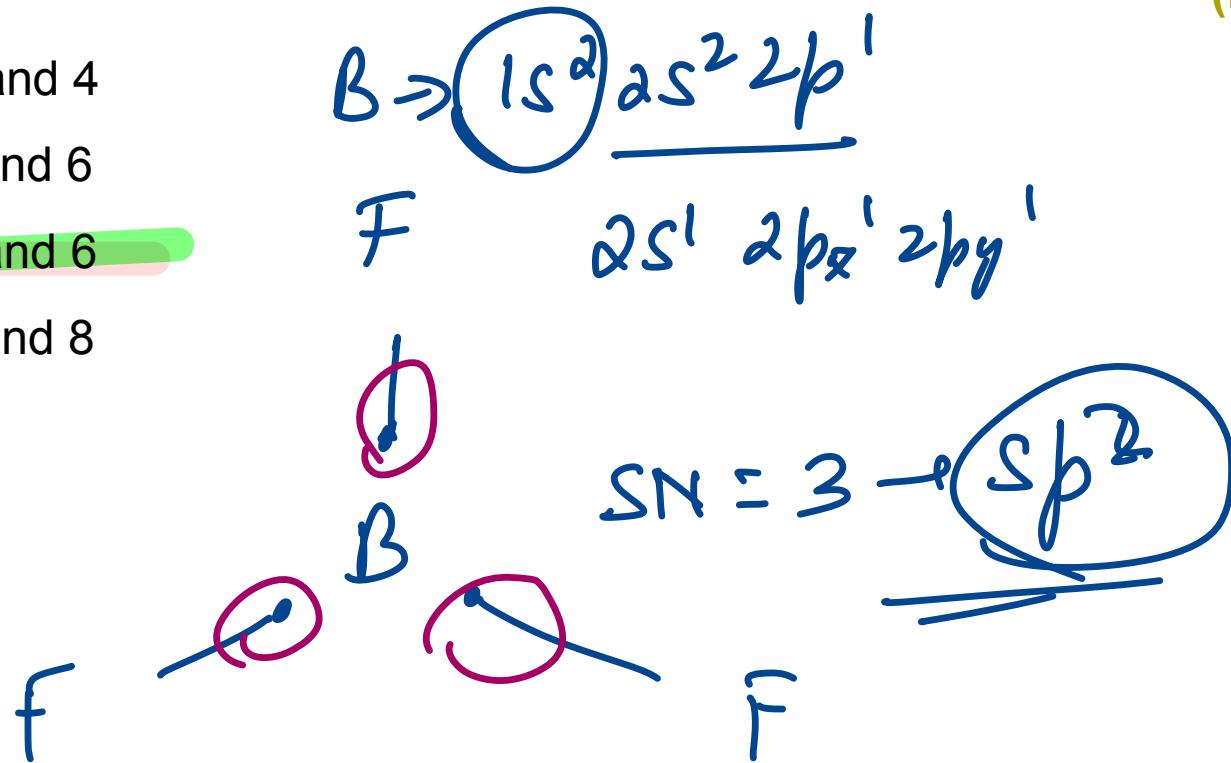


$\text{BF}_3$  is planar and electron deficient compound. Hybridisation and number of electrons around the central atom, respectively are



(NEET 2021)

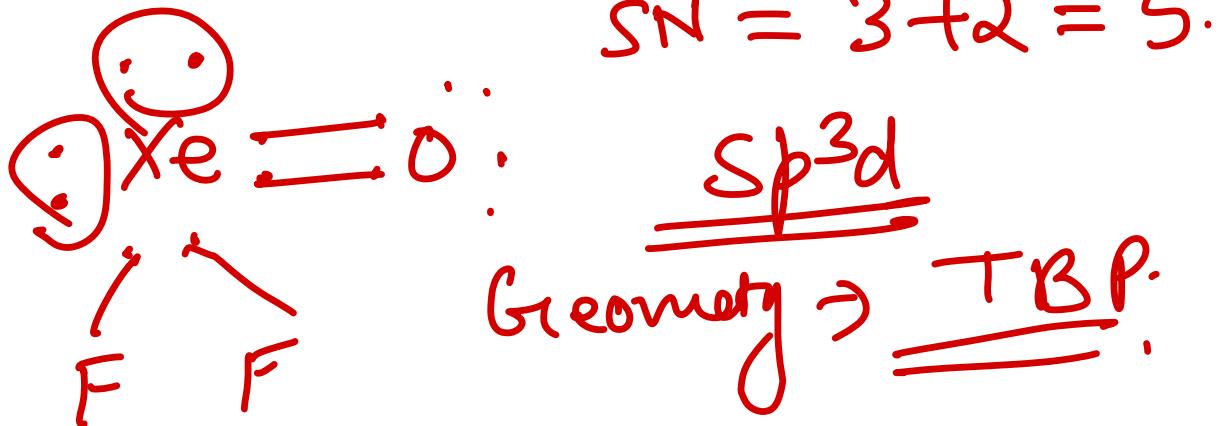
- (a)  $\text{sp}^3$  and 4
- (b)  $\text{sp}^3$  and 6
- (c)  $\text{sp}^2$  and 6
- (d)  $\text{sp}^2$  and 8



$$\underline{\underline{\theta = 120^\circ}}$$

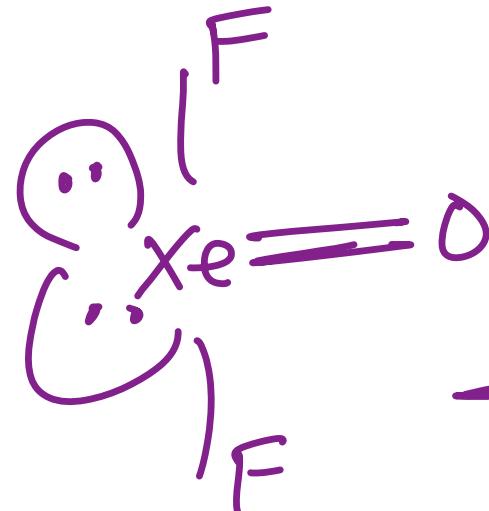
1)  $Xe = 0$   $F_2 \rightarrow$

Shape  $\rightarrow$

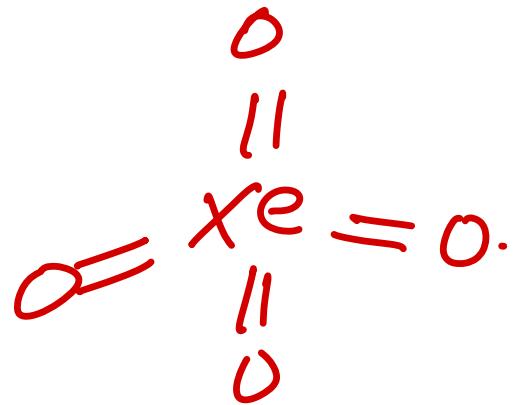
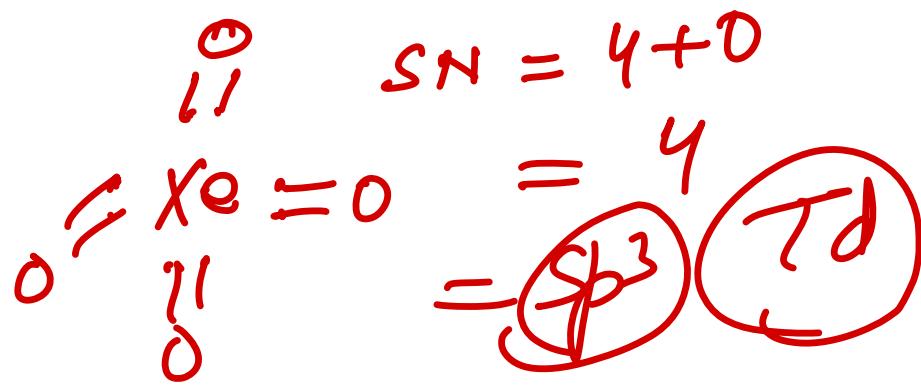


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2)  $XeO_4$



XeO<sub>2</sub>F<sub>2</sub> :-  
Shape = ?

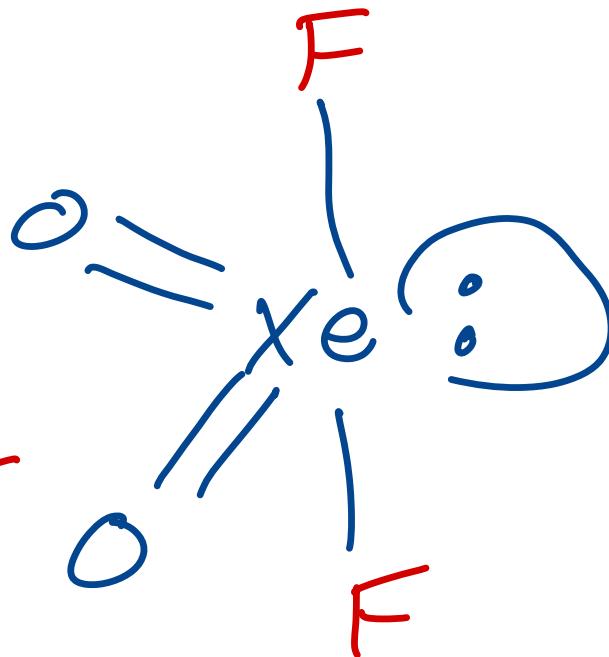
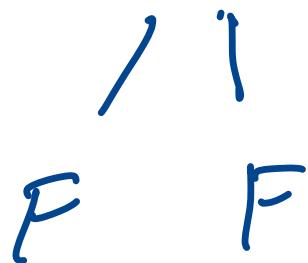


$$SN = 4 + 1 = 5$$

~~sp<sup>3</sup>d~~ → TBP

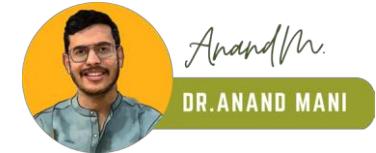


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Identify a molecule which does not exist.

(NEET 2020)



- (a)  $\text{Li}_2$
- (b)  $\text{He}_2$**
- (c)  $\text{O}_2$
- (d)  $\text{C}_2$

Which of the following diatomic molecular species has only  $\pi$ -bonds according to molecular orbital theory?



(NEET 2019)

- (a)  $\text{N}_2$
- (b)  $\text{C}_2$
- (c)  $\text{Be}_2$
- (d)  $\text{O}_2$

Consider the following species  $\text{CN}^+$ ,  $\text{CN}^-$ ,  $\text{NO}$  and  $\text{CN}$  Which one of

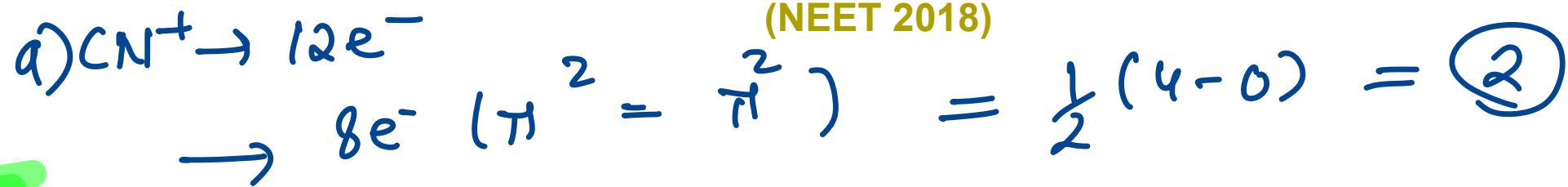
these will have the highest bond order?



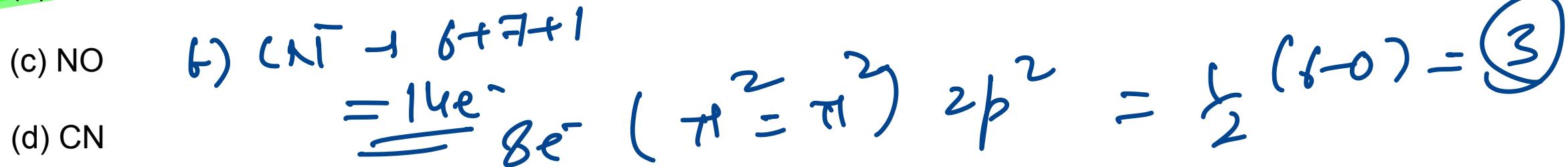
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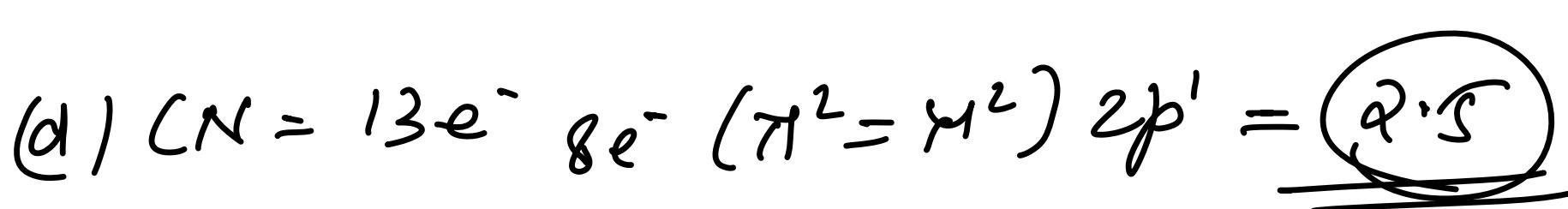
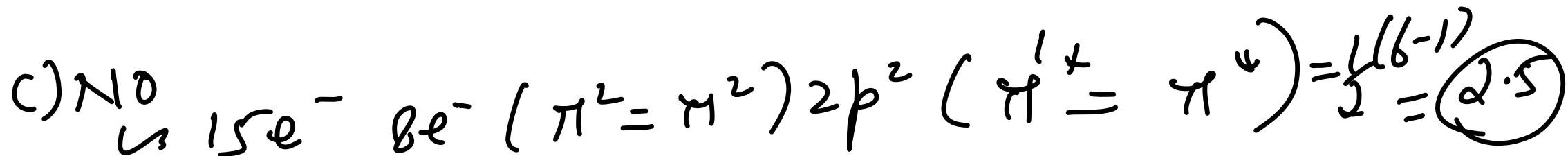
(a)  $\text{CN}^+$



(b)  $\text{CN}^-$



(d)  $\text{CN}$



Which amongst the following is **INCORRECT** statement?

(NEET 2022)



- (a)  $\text{H}_2^+$  ion has one electron. ✓
- (b)  $\text{O}_2^+$  ion is diamagnetic. ✗
- (c) The bond orders of  $\text{O}_2^+$ ,  $\text{O}_2$ ,  $\text{O}_2^-$  and  $\text{O}_2^{2-}$  are 2.5, 2, 1.5 and 1, respectively.
- (d)  $\text{C}_2$  molecule has four electrons in its two degenerate  $\pi$  molecular orbitals.

odd e<sup>-</sup> sp.  $\leftarrow$  paramagnetic

Even e<sup>-</sup> sp.  $\rightarrow$  Diamagnetic

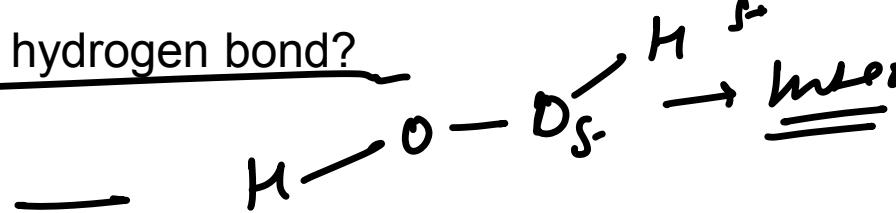
$\text{H}_2$ ,  $\text{O}_2$   
(10e<sup>-</sup>, 16e<sup>-</sup>).

Which one of the following compounds shows the presence of intramolecular hydrogen bond?



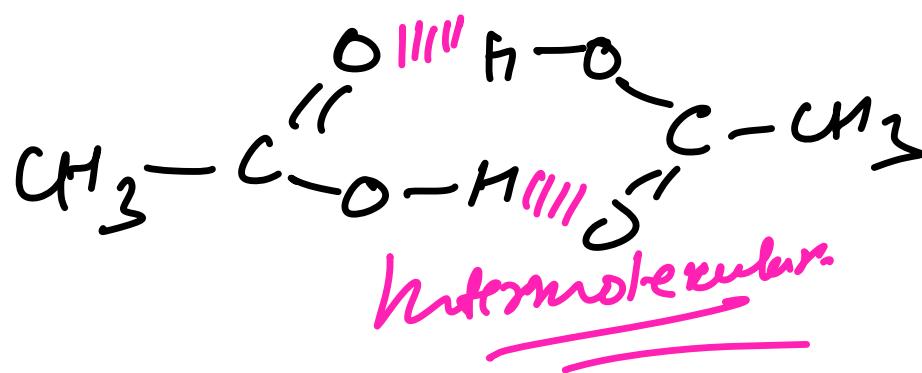
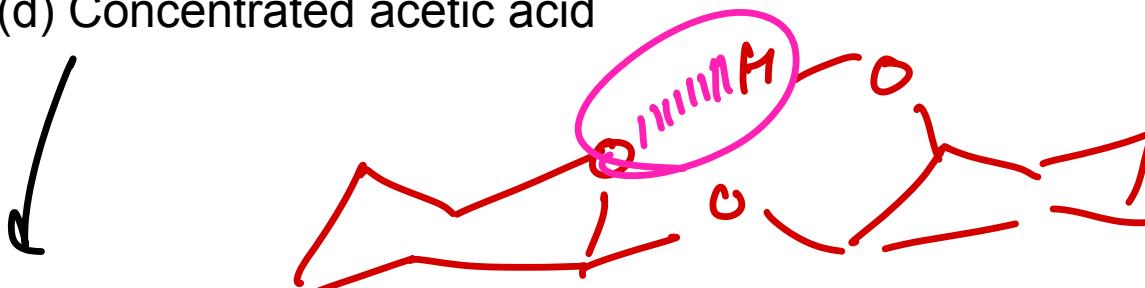
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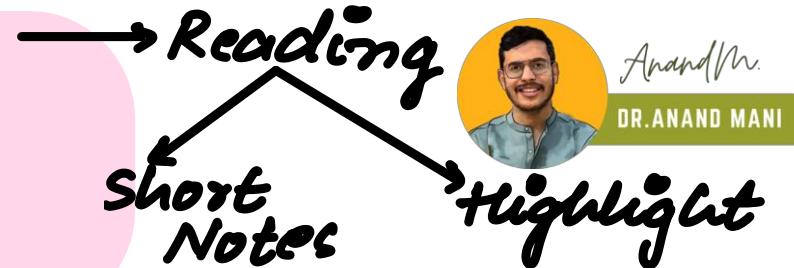


(NEET - II 2016)

- (a)  $\text{H}_2\text{O}_2$
- (b) HCN
- (c) Cellulose
- (d) Concentrated acetic acid



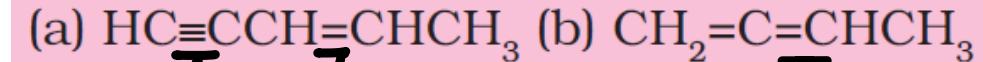
# Organic Chemistry



- *Text Question.*
- *PYQ NCERT (10 years)*

## Problem 8.1

How many  $\sigma$  and  $\pi$  bonds are present in each of the following molecules?



a)  $\pi$  Bonds = 3

$$\pi_{\text{C}=\text{C}} : 1 \quad \pi_{\text{C}\equiv\text{C}} : 2$$

$\sigma$  Bonds = 10

$$\sigma_{\text{C-C}} : 4 \quad \sigma_{\text{C-H}} : 6$$

b)  $\pi$  Bonds : 2

$$\pi_{\text{C}=\text{C}} : 2$$

$\sigma$  Bonds : 9

$$\sigma_{\text{C-C}} : 3 \quad \sigma_{\text{C-H}} : 6$$



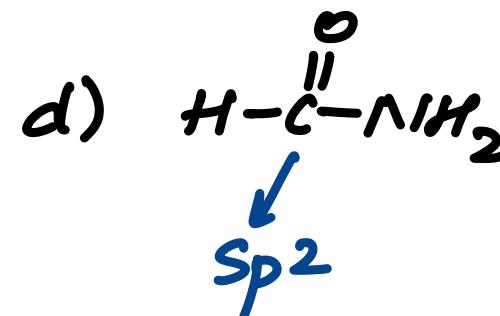
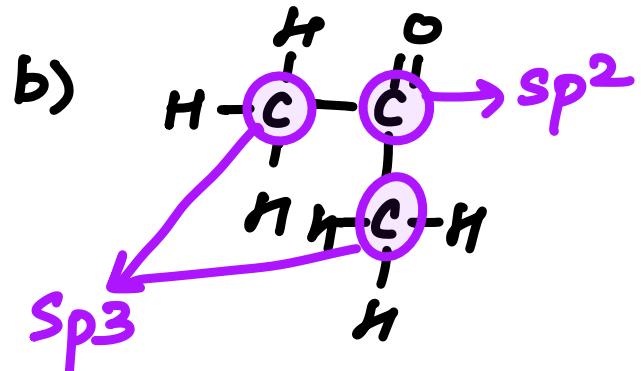
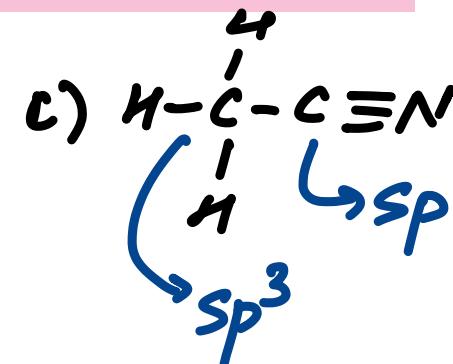
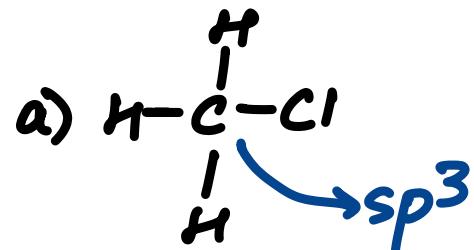
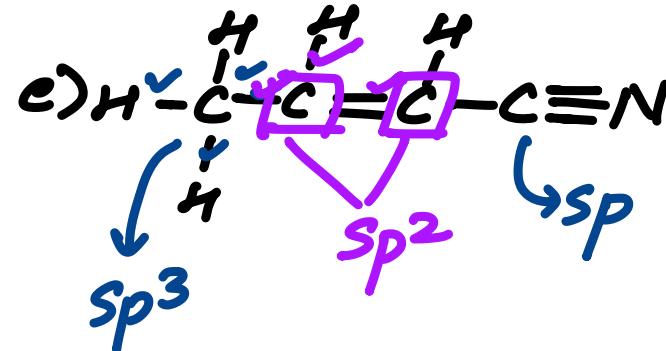
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## Problem 8.2

What is the type of hybridisation of each carbon in the following compounds?

- (a)  $\text{CH}_3\text{Cl}$ , (b)  $(\text{CH}_3)_2\text{CO}$ , (c)  $\text{CH}_3\text{CN}$ ,
- (d)  $\text{HCONH}_2$ , (e)  $\text{CH}_3\text{CH}=\text{CHCN}$

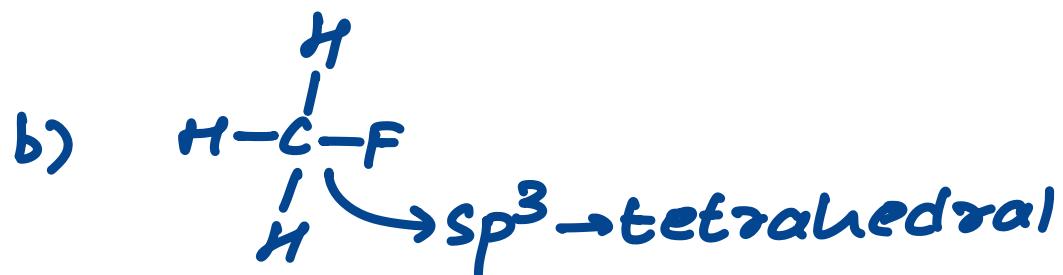


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### Problem 8.3

Write the state of hybridisation of carbon in the following compounds and shapes of each of the molecules.

- (a)  $\text{H}_2\text{C=O}$ , (b)  $\text{CH}_3\text{F}$ , (c)  $\text{HC}\equiv\text{N}$ .



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The number of  $\sigma$  bonds,  $\pi$  bonds and lone pair of electrons in **pyridine** respectively are:

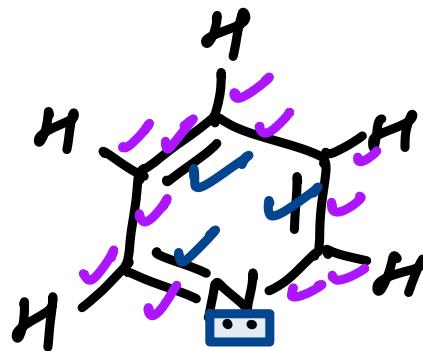
(a) 11, 3, 1       (b) 12, 2, 1   
 (c) 11, 2, 0  (d) 12, 3, 0



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**(NEET 2023)**



$$\lambda \cdot p = 1$$

$$\pi = 3$$

$$\sigma = 11.$$

Which of the following molecules represents the order of hybridisation  $sp^2, sp^2, sp, sp$  from left to right atoms?

- (a)  $\text{H}-\text{C}\equiv\text{C}-\text{C}\equiv\text{CH}$
- (b)  $\text{CH}_2-\text{CH}-\text{CH}-\text{C}\equiv\text{CH}$
- (c)  $\text{CH}_2=\text{CH}-\text{CH}=\text{CH}_2$
- (d)  $\text{CH}_3-\text{CH}=\text{CH}-\text{CH}_3$

(NEET 2018)

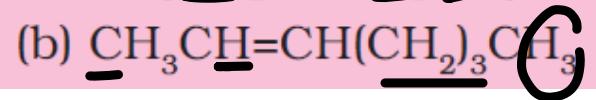
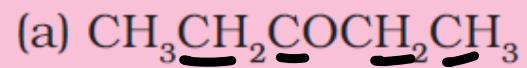


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### Problem 8.4

Expand each of the following condensed formulas into their complete structural formulas.

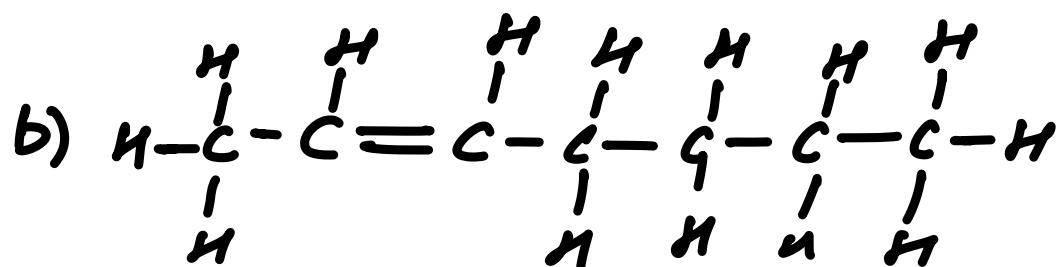
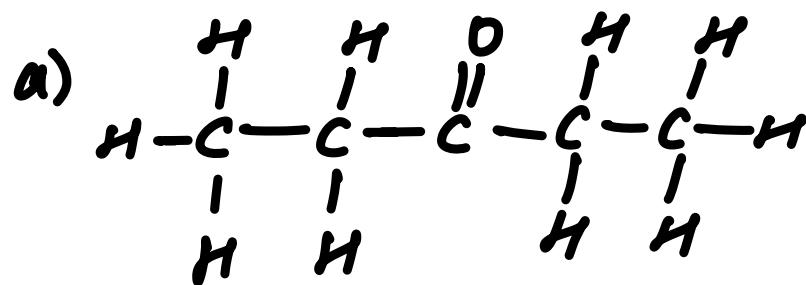


open chain



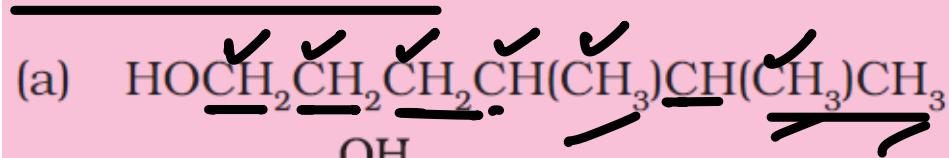
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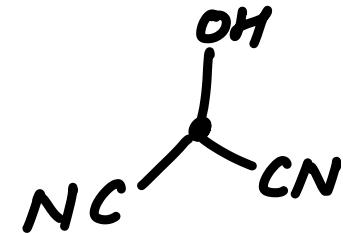


### Problem 8.5

For each of the following compounds, write a condensed formula and also their bond-line formula.

- (a) 
- (b)  $\text{N} \equiv \text{C} - \text{CH} - \text{C} \equiv \text{N}$

b)  $\text{HOCH}(\text{CN})_2$



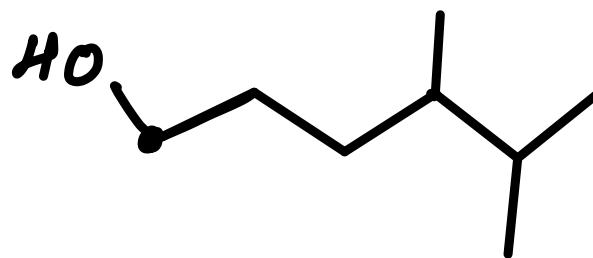
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condensed formula:

a)  $\text{HO}(\text{CH}_2)_3\text{CH}(\text{CH}_3)\text{CH}(\text{CH}_3)_2$

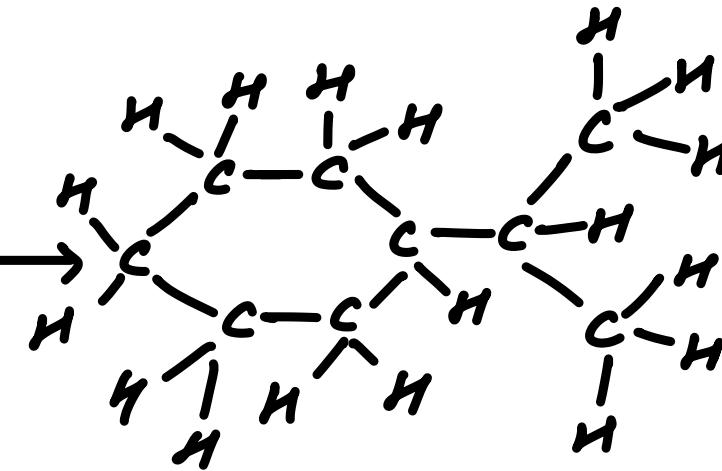
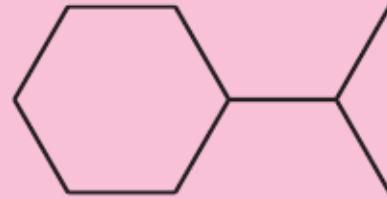
Bond line formula:



### Problem 8.6

Expand each of the following bond-line formulas to show all the atoms including carbon and hydrogen

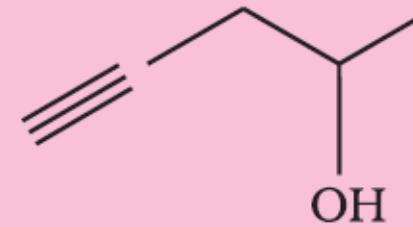
(a)



(b)



(c)

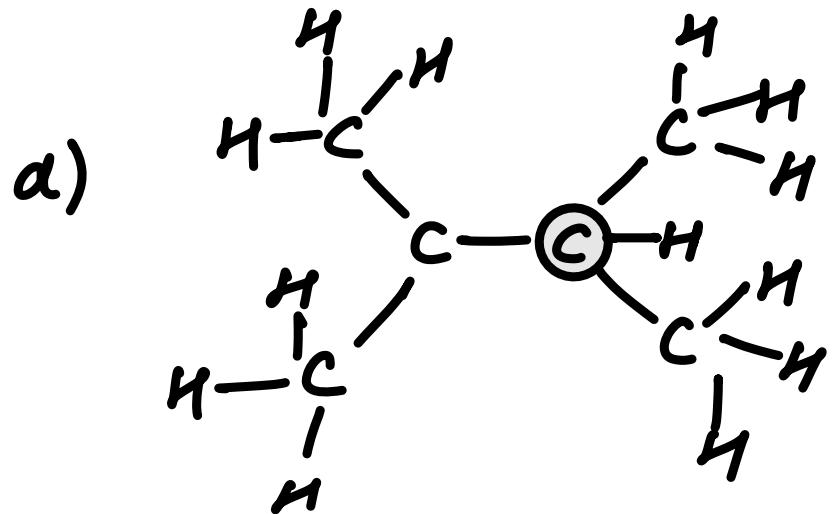
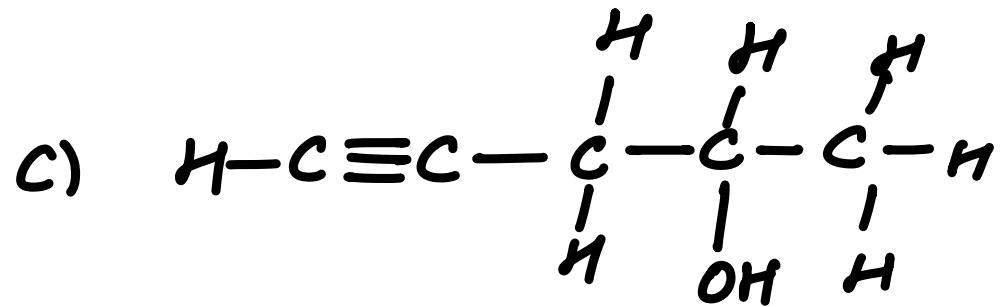
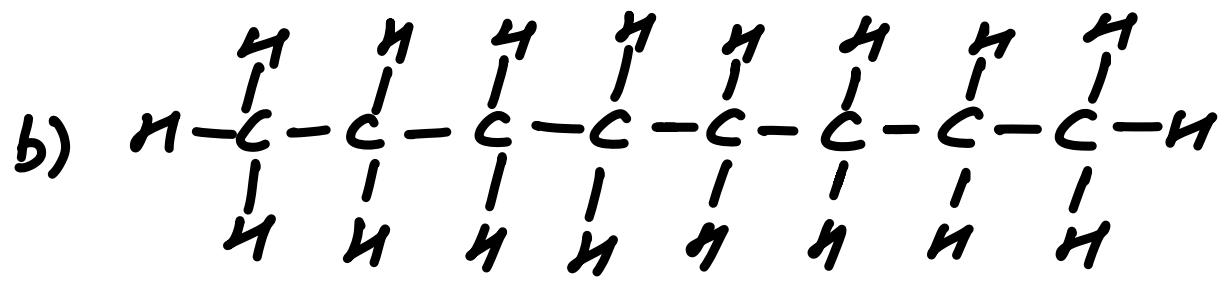


(d)



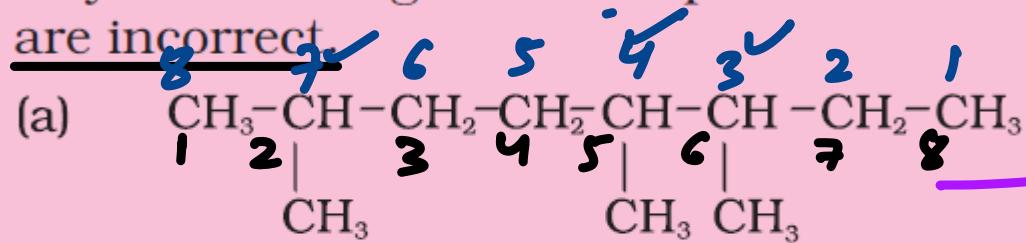
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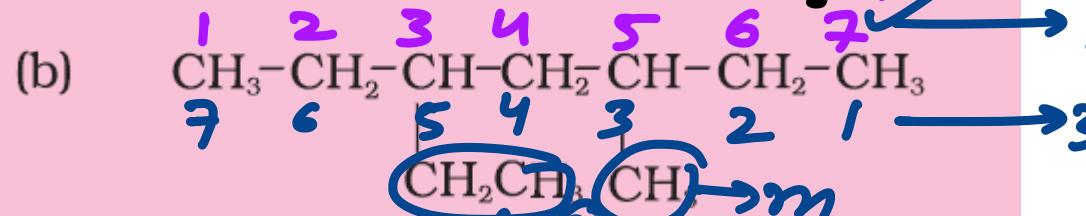
### Problem 8.7

Structures and IUPAC names of some hydrocarbons are given below. Explain why the names given in the parentheses are incorrect.



2,5,6- Trimethyloctane

[and not 3,4,7-Trimethyloctane]



3-Ethyl-5-methylheptane

[and not 5-Ethyl-3-methylheptane]

✓  
2,5,6  
3,4,5 → lowest No

3,5

3,5

alphabet  
lowest  
No.

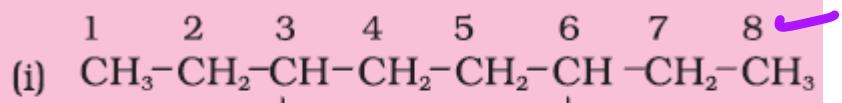


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### Problem 8.8

Write the IUPAC names of the compounds i-iv from their given structures.



$\begin{array}{c} \boxed{\text{OH}} \\ | \\ \text{CH}_3 \end{array} \rightarrow 2^\circ \text{prefix.}$   
 $\hookrightarrow 2^\circ \text{suffix} \xrightarrow{\text{methyl}}$

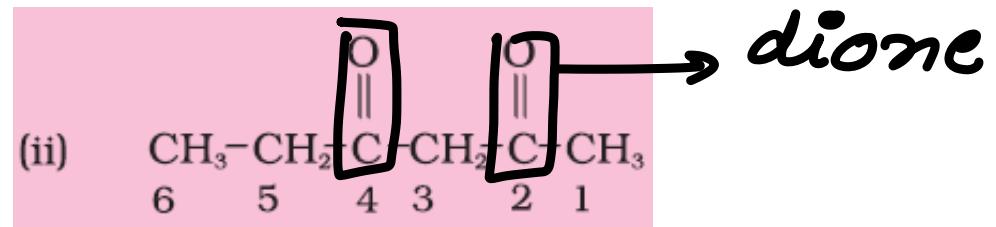


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$2^\circ \text{prefix} + 1^\circ \text{prefix} + \underset{\text{Root}}{\text{word}} + \underline{1^\circ \text{suffix}} + 2^\circ \text{suffix}$

6-methyloctan-3-ol

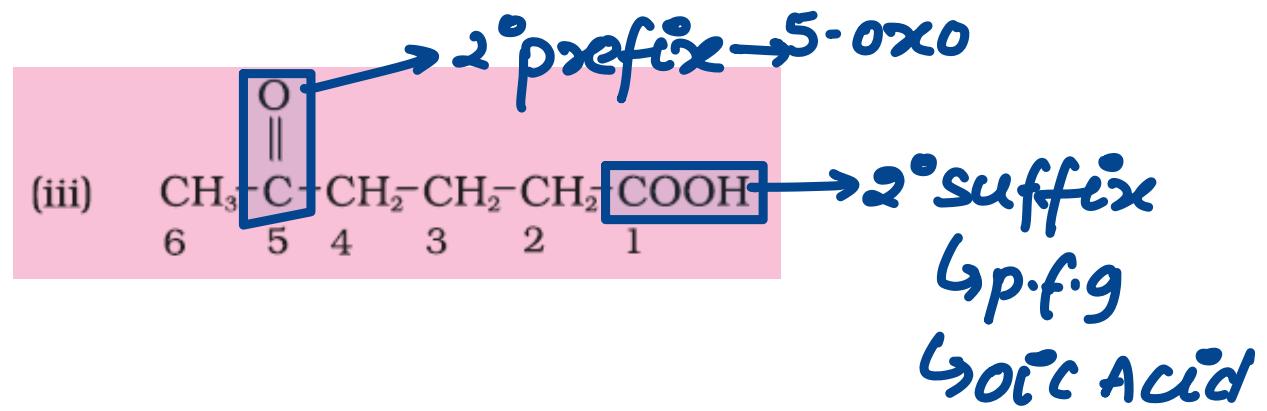


Hexane-2,4-dione



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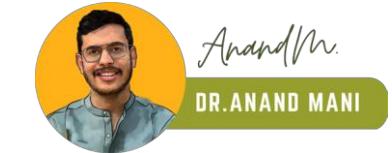
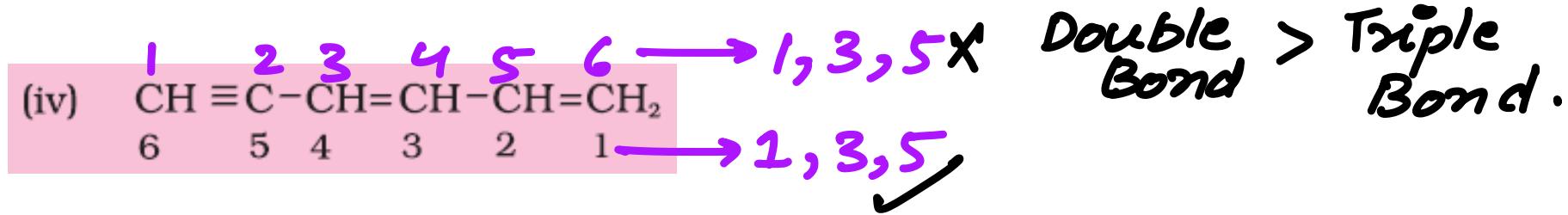
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5-oxohexan-1-oic Acid (BEST)

or  
5-oxohexanoic Acid (OK)

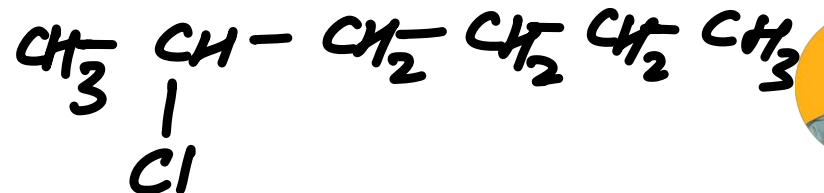


Hexa-1,3-diene-5-yne

**Problem 8.9**

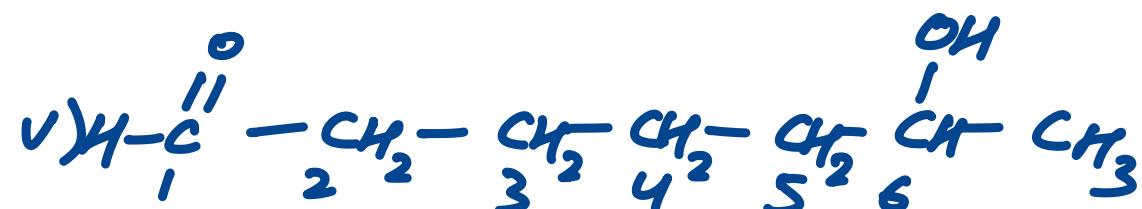
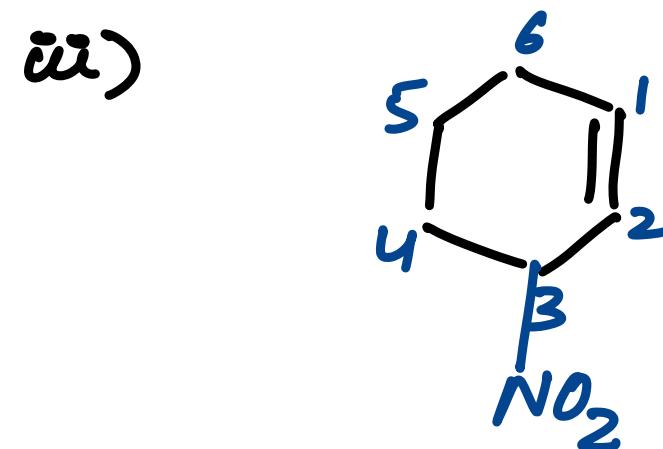
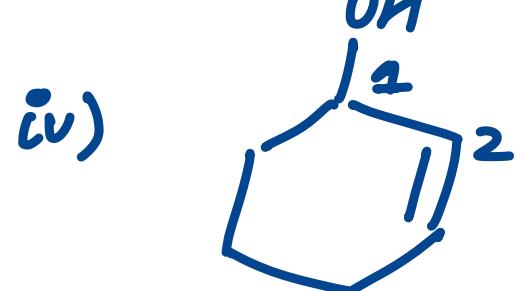
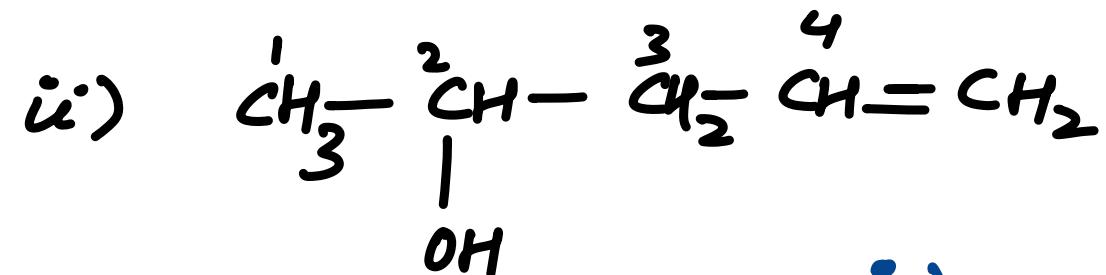
Derive the structure of (i) 2-Chlorohexane,  
(ii) Pent-4-en-2-ol, (iii) 3-Nitrocyclohexene,  
(iv) Cyclohex-2-en-1-ol, (v) 6-Hydroxyheptanal.

→ i)



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### Problem 8.10

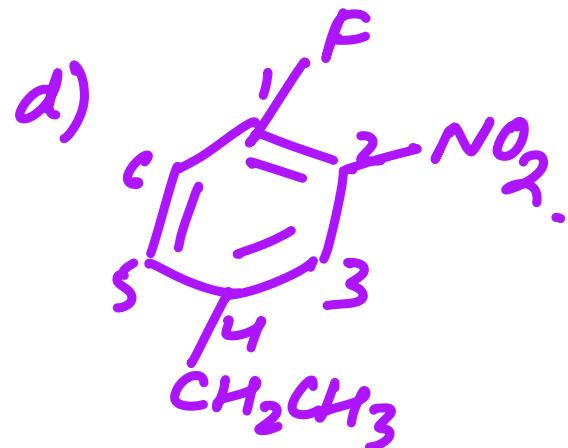
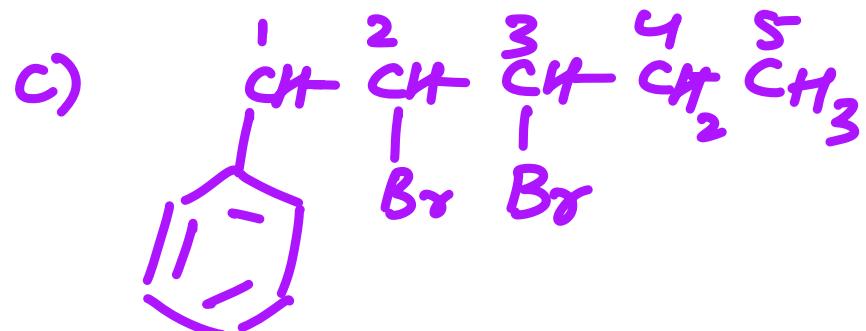
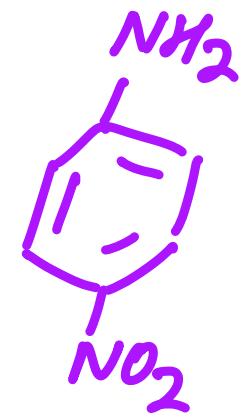
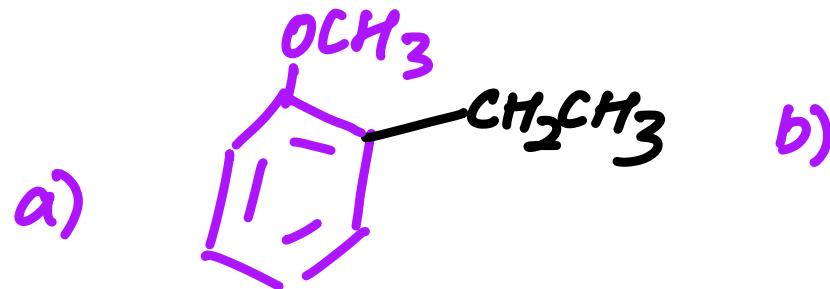
Write the structural formula of:

- (a) *o*-Ethylanisole, (b) *p*-Nitroaniline,
- (c) 2,3 - Dibromo - 1 - phenylpentane,
- (d) 4-Ethyl-1-fluoro-2-nitrobenzene.

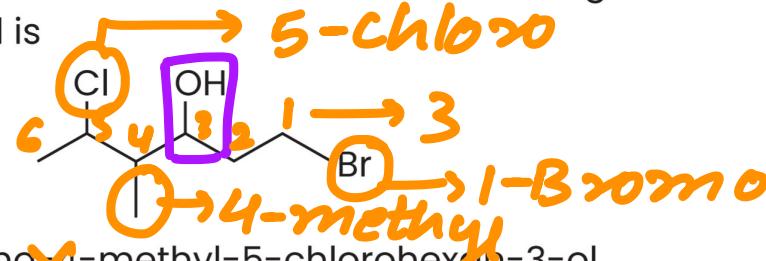


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The correct IUPAC name of the following compound is

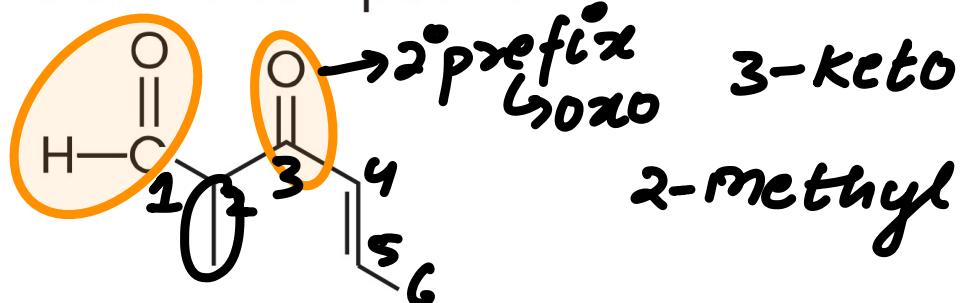


- (a) 1-bromo-4-methyl-5-chlorohexan-3-ol
- (b) 6-bromo-4-methyl-2-chlorohexan-4-ol
- (c) 1-bromo-5-chloro-4-methylhexan-3-ol
- (d) 6-bromo-2-chloro-4-methyhexan-4-ol

(NEET 2022)



The IUPAC name of the compound



- (a) 5-formylhex-2-en-3-one
- (b) 5-methyl-4-oxohex-2-en-5-al
- (c) 3-keto-2-methylhex-5-enal
- (d) ~~3-keto~~-2-methylhex-4-enal (NEET 2017)



3-keto-2-methylhex-4-en-1-al

Myoti Rani  
(m.sc → DU)

[t.me/anandmani001](https://t.me/anandmani001)

### Problem 8.11

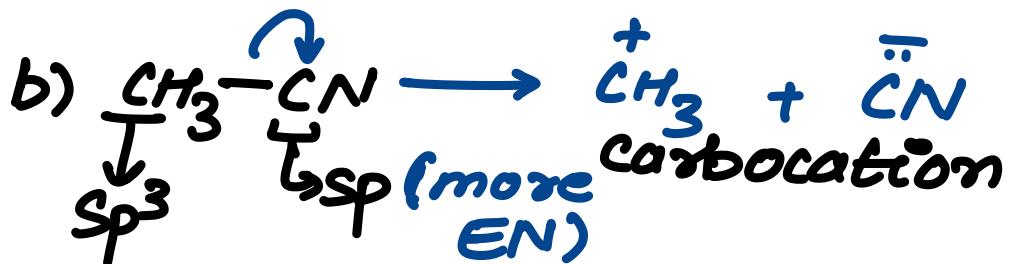
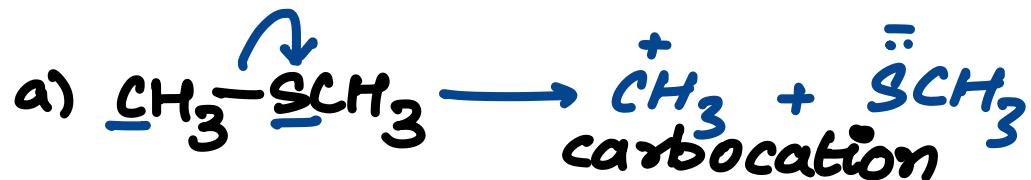
Using curved-arrow notation, show the formation of reactive intermediates when the following covalent bonds undergo heterolytic cleavage.

- (a)  $\text{CH}_3\text{-SCH}_3$ , (b)  $\text{CH}_3\text{-CN}$ , (c)  $\text{CH}_3\text{-Cu}$



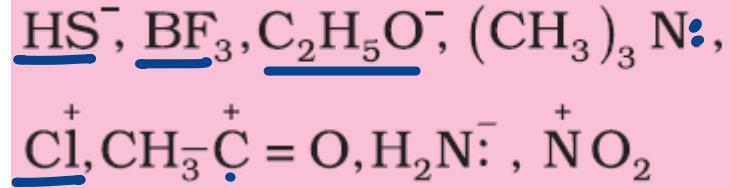
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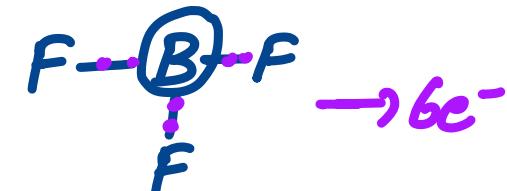
### Problem 8.12

Giving justification, categorise the following molecules/ions as nucleophile or electrophile:  $\rightarrow \text{Nuc}/\text{E.P}$



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Nucleophile :-  $\text{HS}^-$ ,  $\text{C}_2\text{H}_5\text{O}^-$ ,  $(\text{CH}_3)_3\text{N}^-$ ,  $\text{H}_2\text{N}^-$

Electrophile :-  $\text{BF}_3$ ,  $\text{Cl}^+$ ,  $\text{CH}_3^-\overset{+}{\text{C}}=\text{O}$ ,  $\overset{+}{\text{N}}\text{O}_2$

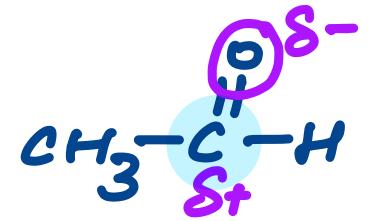
### Problem 8.13

Identify electrophilic centre in the following:  $\text{CH}_3\text{CH=O}$ ,  $\text{CH}_3\text{CN}$ ,  $\text{CH}_3\text{I}$ .



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Which of the following statements is not correct for a nucleophile?

- (a) Ammonia is a nucleophile.
- (b) Nucleophiles attack low  $e^-$  density sites.
- (c) Nucleophiles are not electron seeking ✓
- ~~(d)~~ Nucleophile is a Lewis acid. (AIPMT 2015)



↳ *lone pair accept*

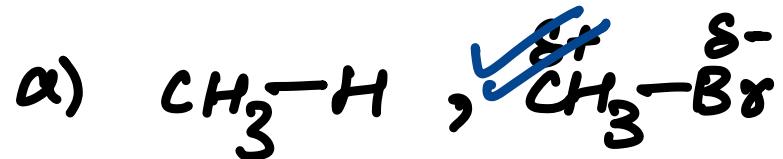
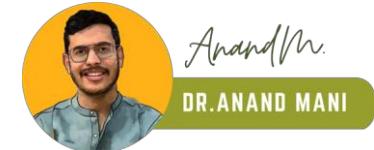


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### Problem 8.14

Which bond is more polar in the following pairs of molecules: (a)  $\text{H}_3\text{C}-\text{H}$ ,  $\text{H}_3\text{C}-\text{Br}$   
(b)  $\text{H}_3\text{C}-\text{NH}_2$ ,  $\text{H}_3\text{C}-\text{OH}$  (c)  $\text{H}_3\text{C}-\text{OH}$ ,  $\text{H}_3\text{C}-\text{SH}$



### Problem 8.15

In which C-C bond of  $\text{CH}_3\text{CH}_2\text{CH}_2\text{Br}$  the inductive effect is expected to be the least?

Note:  $\rightarrow$  Inductive effect  $\propto \frac{1}{\text{distance}}$

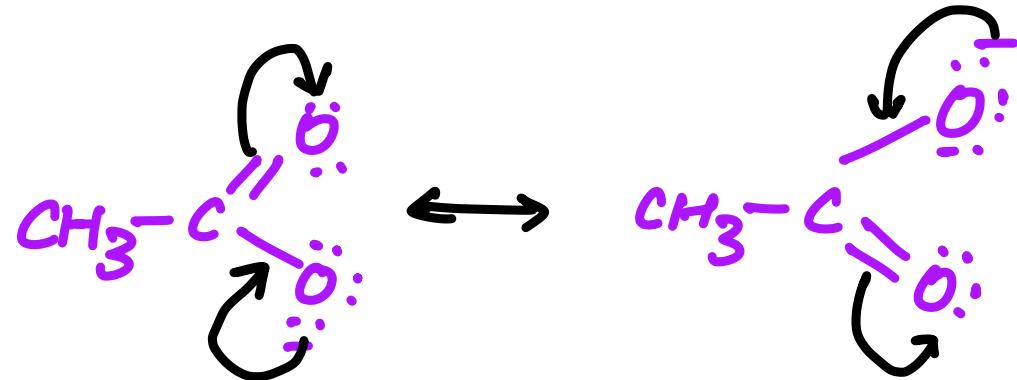


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### Problem 8.16

Write resonance structures of  $\text{CH}_3\text{COO}^-$  and show the movement of electrons by curved arrows.



Equivalent Resonating Structure.

### Problem 8.17

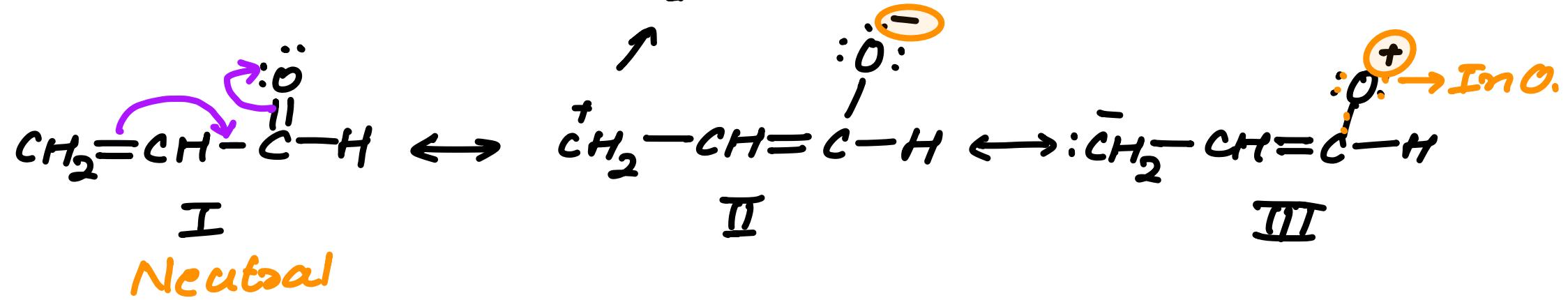
Write resonance structures of  $\text{CH}_2=\text{CH}-\text{CHO}$ . Indicate relative stability of the contributing structures.



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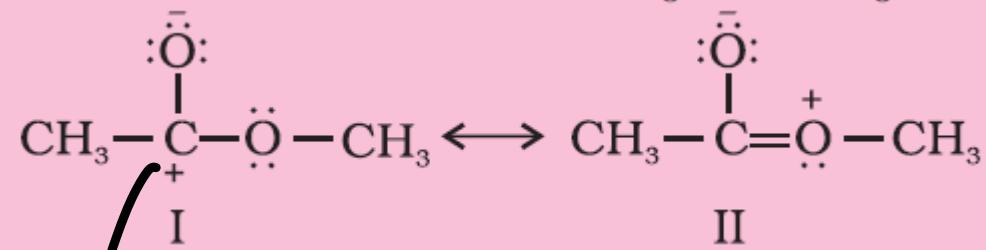
## Incomplete.



**I > II > III**

### Problem 8.18

Explain why the following two structures, I and II cannot be the major contributors to the real structure of  $\text{CH}_3\text{COOCH}_3$ .



Both are  
→ charged

Incomplete  
octet.



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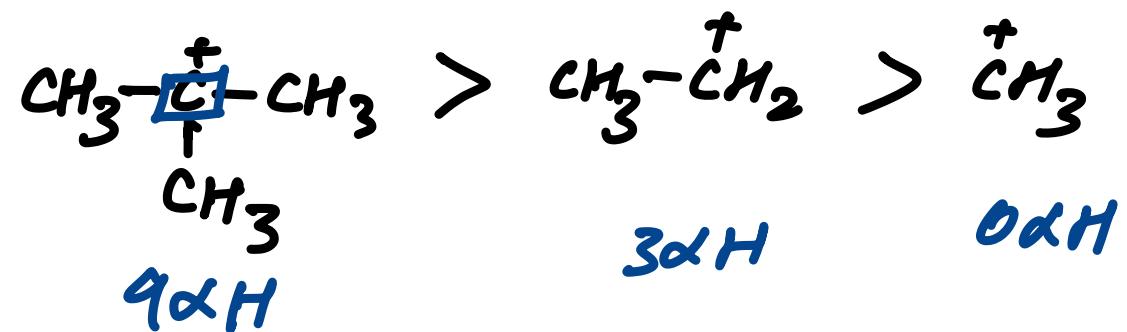
### Problem 8.19

Explain why  $(\text{CH}_3)_3\overset{+}{\text{C}}$  is more stable than  $\text{CH}_3\overset{+}{\text{C}}\text{H}_2$  and  $\overset{+}{\text{C}}\text{H}_3$  is the least stable cation.



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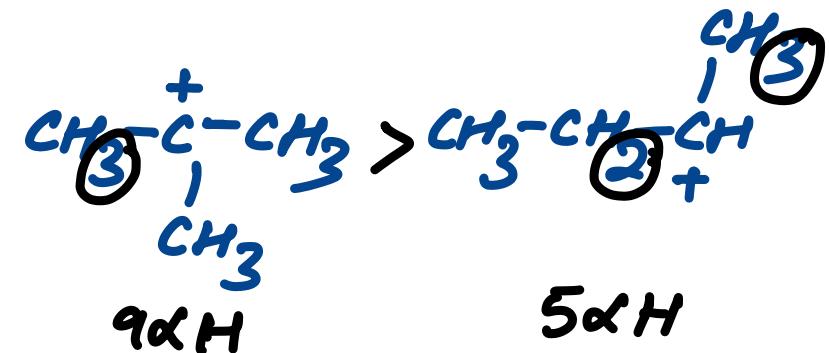
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A tertiary butyl carbocation is more stable than a secondary butyl carbocation because of which of the following?

- (a) -I effect of  $\text{CH}_3$  groups *alkyl I*
- (b) +R effect of  $\text{CH}_3$  groups  $\times$
- (c)  $-\text{R}$  effect of  $\text{CH}_3$  groups  $\times$
- ~~Hyperconjugation~~

(NEET 2020)

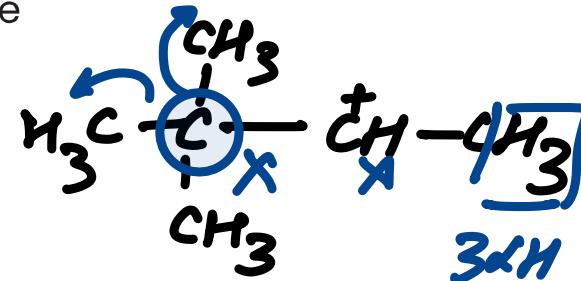


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The most stable carbocation, among the following is

- (a)  $(\text{CH}_3)_3\text{C}^+$   $\rightarrow 3\Delta H$
- (b)  $\text{CH}_3-\text{CH}_2-\text{CH}^+-\text{CH}_2-\text{CH}_2-\text{CH}_3 \rightarrow 4\Delta H$
- (c)  ~~$\text{CH}_3-\text{CH}^+-\text{CH}_2-\text{CH}_2-\text{CH}_2-\text{CH}_3 \rightarrow 5\Delta H$~~
- (d)  $\text{CH}_3-\text{CH}^+-\text{CH}_2$   $2\Delta H$



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$$d) < a) < b) < c)$$

# HYDROCARBONS



→ NCERT

Short  
Note

→ INTEX Question

→ PYQ (10 Year)

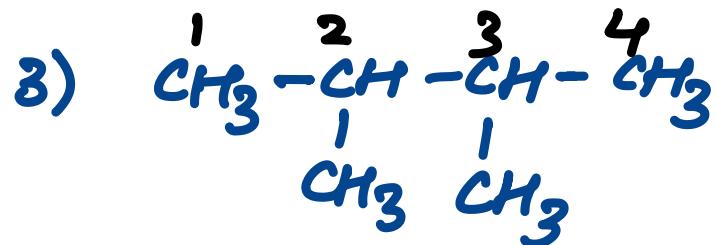


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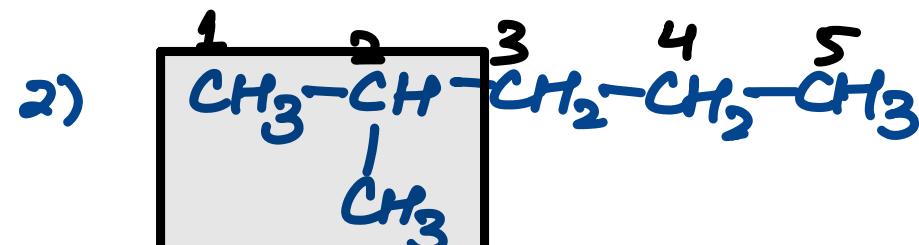
### Problem 9.1

Write structures of different chain isomers of alkanes corresponding to the molecular formula  $C_6H_{14}$ . Also write their IUPAC names.



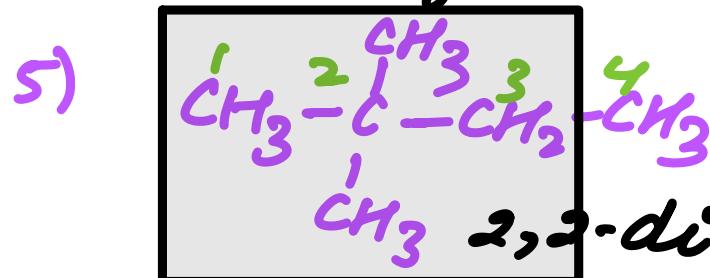
Hexane

(n-Hexane)

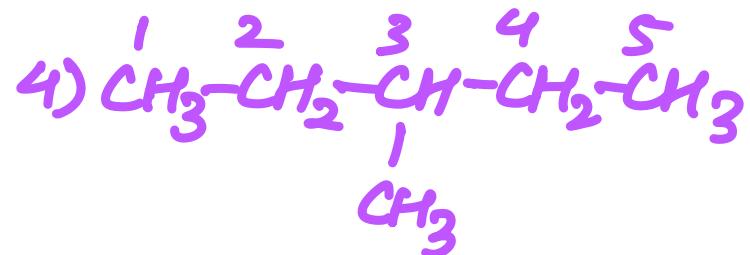


2-Methylpentane  
(Isohexane)

2,3-dimethylbutane



2,2-dimethyl  
Butane  
(neohexane)



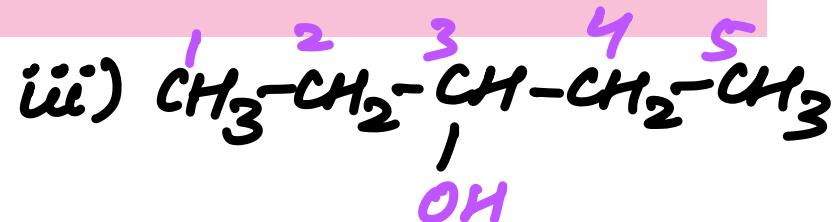
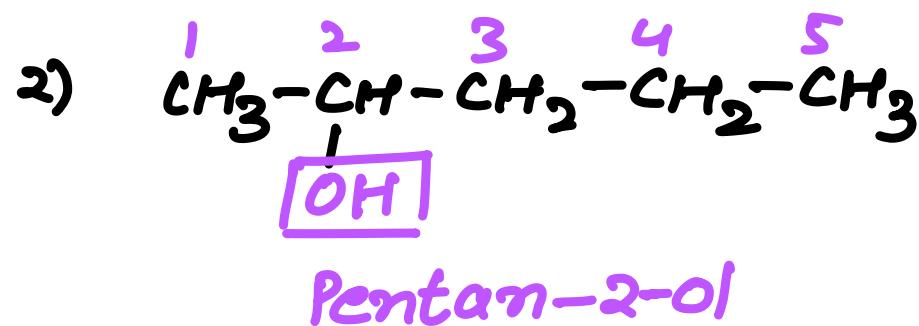
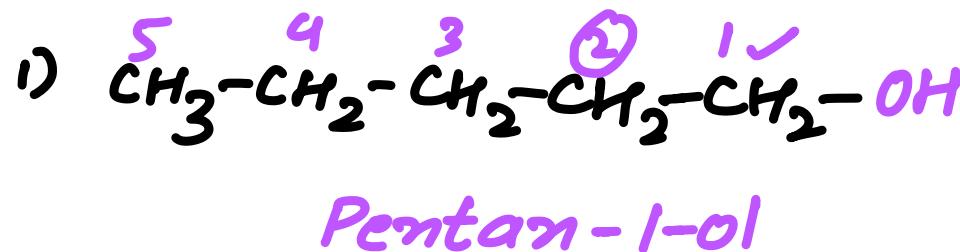
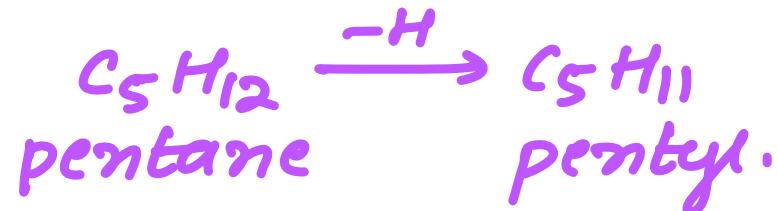
3-methylpentane

### Problem 9.2

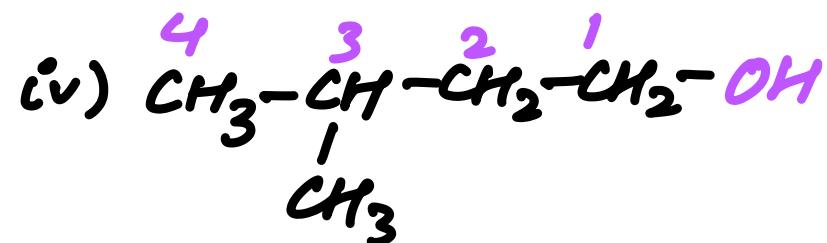
Write structures of different isomeric alkyl groups corresponding to the molecular formula  $C_5H_{11}$ . Write IUPAC names of alcohols obtained by attachment of  $-OH$  groups at different carbons of the chain.



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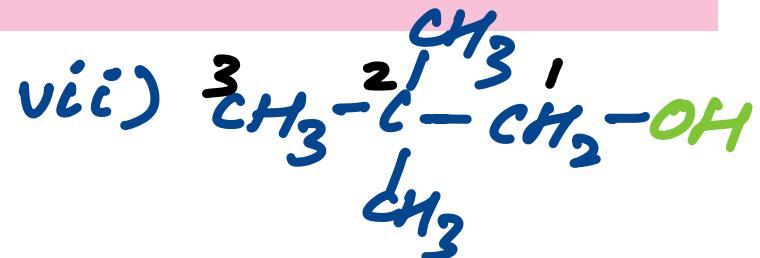
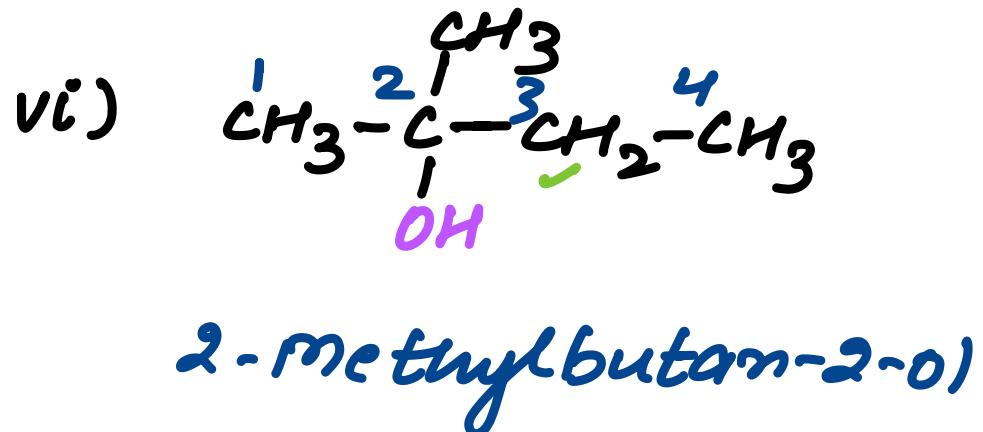
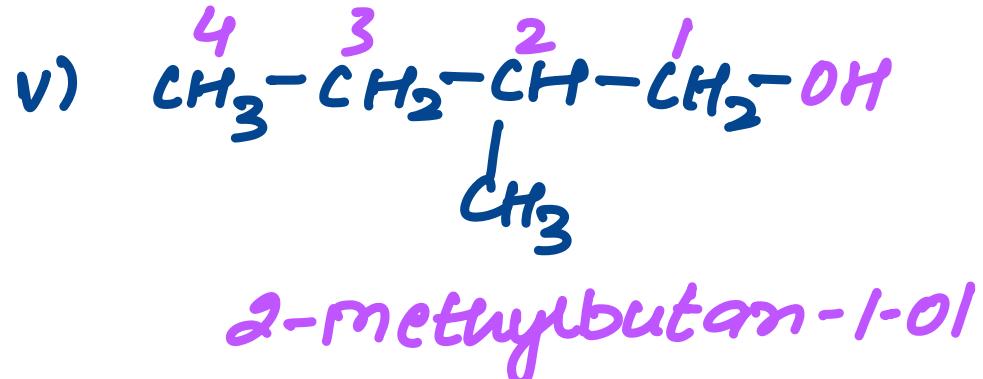
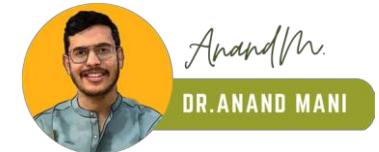
## Pentan-3-ol



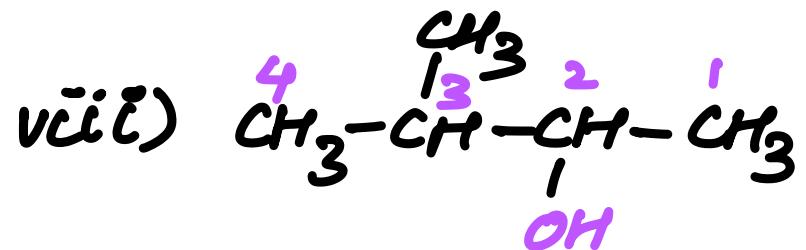
# 3-MethylButen-1-ol

### Problem 9.2

Write structures of different isomeric alkyl groups corresponding to the molecular formula  $C_5H_{11}$ . Write IUPAC names of alcohols obtained by attachment of  $-OH$  groups at different carbons of the chain.



# 2,2-dimethylpropan-1-ol

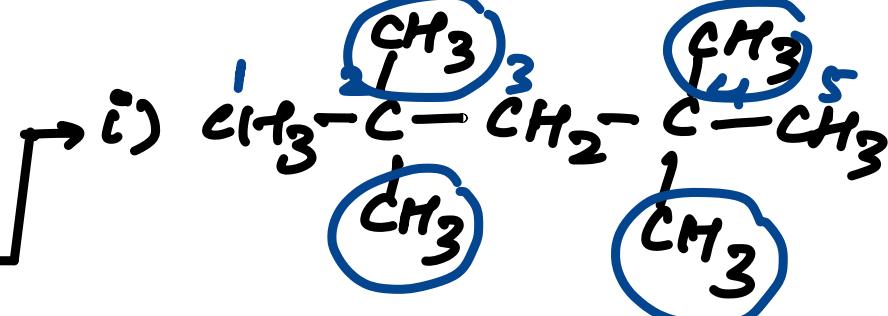


## 3-methylbutan-2-ol

### Problem 9.3

Write IUPAC names of the following compounds :

- (i)  $(CH_3)_3 C CH_2 C(CH_3)_3$   
(ii)  $(CH_3)_2 C(C_2H_5)_2$   
(iii) tetra - *tert*-butylmethane

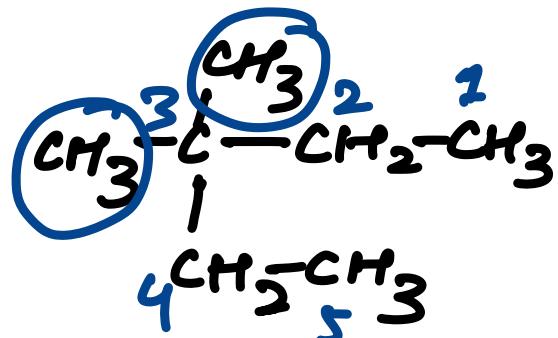


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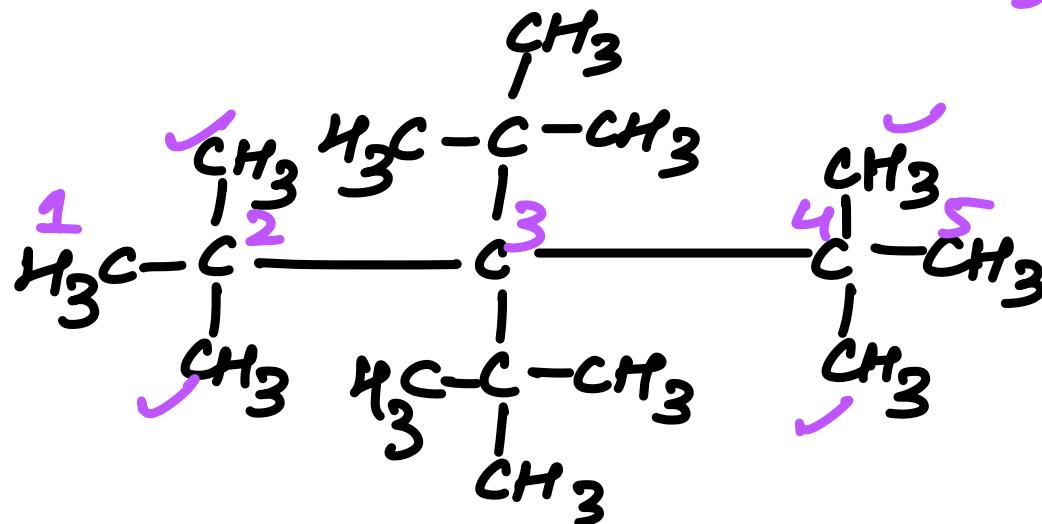
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# 2,2,4,4-tetramethylpentane

11



# 3,3-dimethylpentane



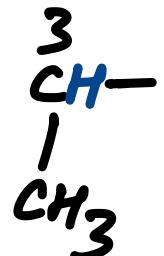
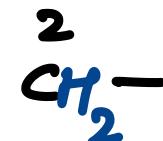
3,3-ditertbutyl-2,2,4,4-tetramethylpentane

### Problem 9.4

Write structural formulas of the following compounds :

- (i) 3, 4, 4, 5-Tetramethylheptane  
(ii) 2, 5-Dimethylhexane

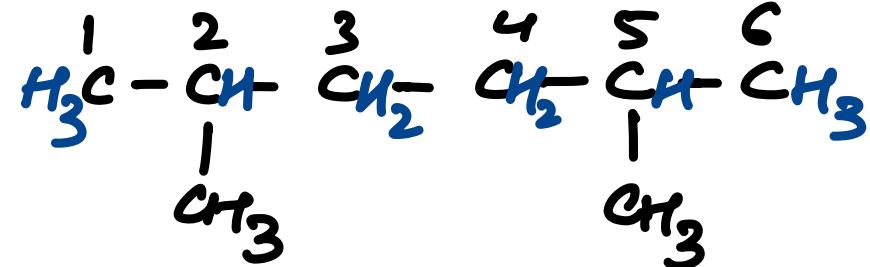
10



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6



### Problem 9.5

Write structures for each of the following compounds. Why are the given names incorrect? Write correct IUPAC names.

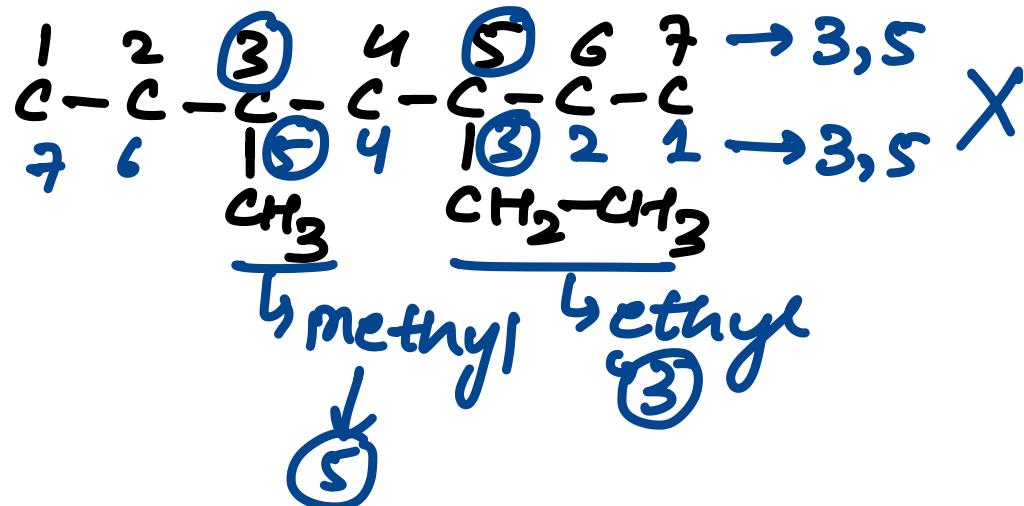
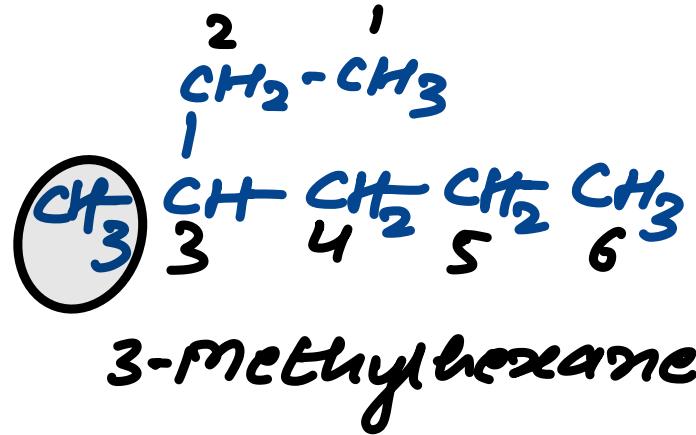
(i) 2-Ethylpentane

(ii) 5-Ethyl - 3-methylheptane



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3-ethyl-5-methylheptane.

Which of the following alkane cannot be made in good yield by Wurtz reaction? 

## Even no. / Symmetrical carbon



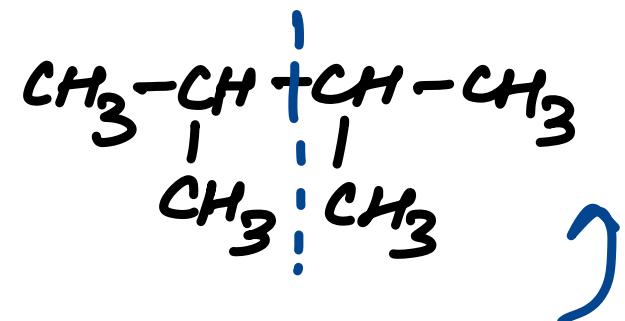
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- (a) 2, 3-dimethylbutane

(b) n-heptane → 7 → odd no

(c) n-butane

(d) n-hexane



Hydrocarbon (A) reacts with bromine by substitution to form an alkyl bromide which by Wurtz reaction is converted to gaseous hydrocarbon containing less than four carbon atoms. A is

- (a)  $\text{CH}_3-\text{CH}_2\text{Br}$  (b)  $\text{CH}_2=\text{CH}_2\text{Br}$   
(c)  $\text{CH}_3-\text{CH}_2-\text{CH}_2\text{Br}$  (d)  $\text{CH}_4$  (NEET 2018)



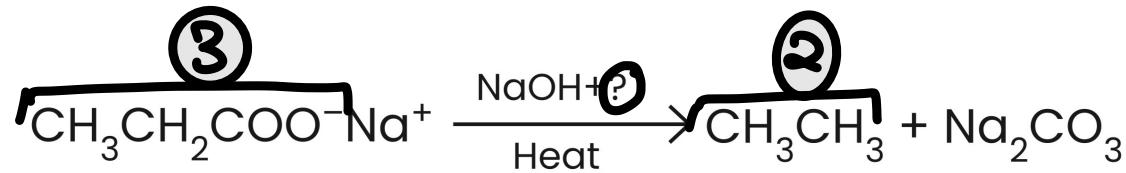
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### Problem 9.6

Sodium salt of which acid will be needed for the preparation of propane ? Write chemical equation for the reaction.





Consider the above reaction and identify the missing reagent/chemical.

- (a)  $\text{B}_2\text{H}_6$       (b) Red phosphorus  
~~(c)  $\text{CaO}$~~       (d) DIBAL-H

**(NEET 2021)**



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The correct statement regarding the comparison of staggered and eclipsed conformations of ethane, is

(a) the eclipsed conformation of ethane is more stable than staggered conformation, because eclipsed conformation has no torsional strain. X

(b) the eclipsed conformation of ethane is more stable than staggered conformation even though the eclipsed conformation has torsional strain. X

✓ the staggered conformation of ethane is more stable than eclipsed conformation, because staggered conformation has no torsional strain.

(d) the staggered conformation of ethane is less stable than eclipsed conformation, because staggered conformation has torsional strain. X

**(NEET-I 2016)**

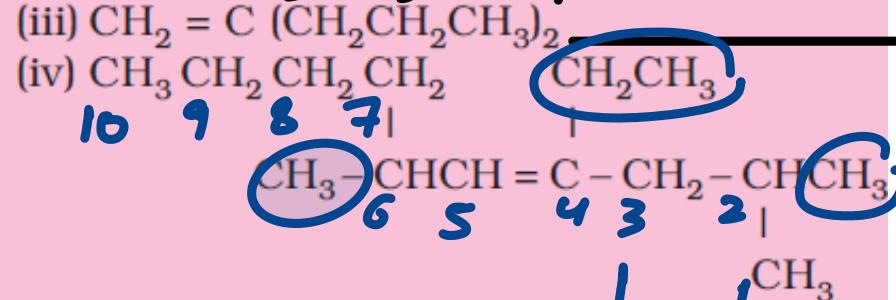
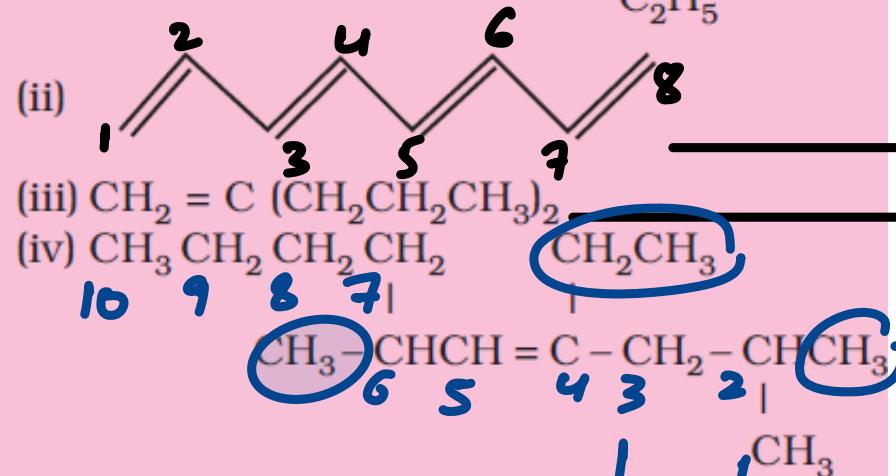
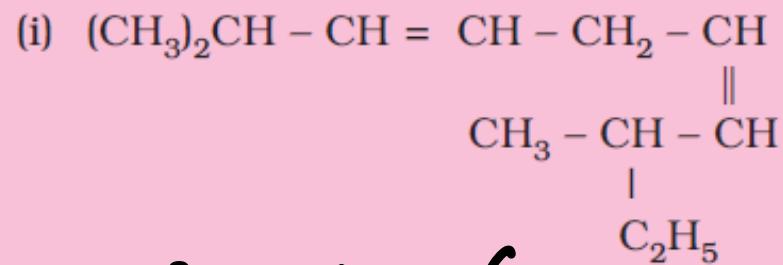


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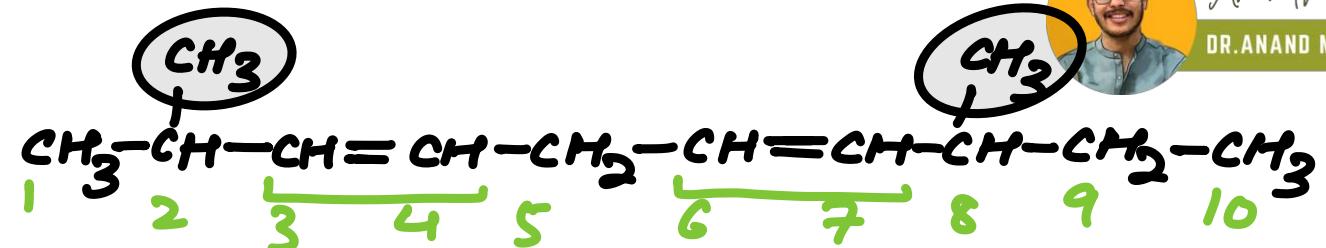
### Problem 9.7

Write IUPAC names of the following compounds:



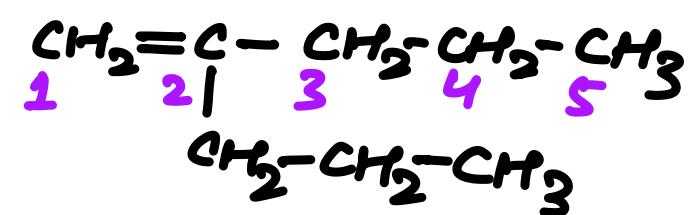
$\downarrow$

4-ethyl-2,6-dimethyldec-4-ene



2,8-dimethyldeca-3,6-dien

Octa-1,3,5,7-tetraene.



2-propylpent-1-ene



### Problem 9.9

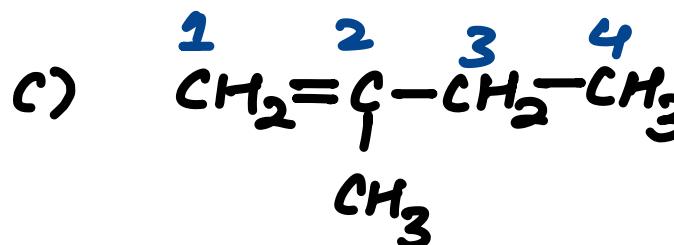
Write structures and IUPAC names of different structural isomers of alkenes corresponding to  $C_5H_{10}$ .



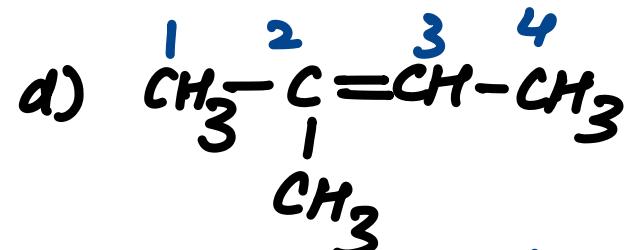
Pent-1-ene



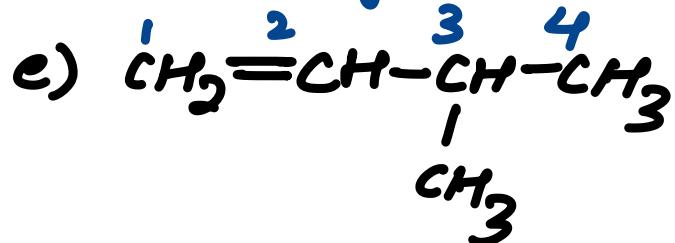
Pent-2-ene



2-Methylbut-1-ene



2-Methylbut-2-ene



3-Methylbut-1-ene

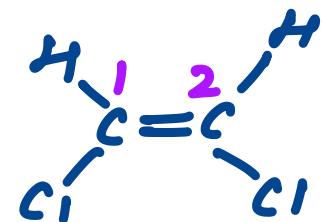
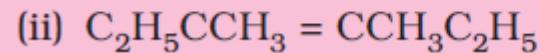


Anand M.

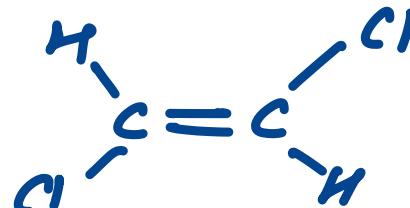
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### Problem 9.10

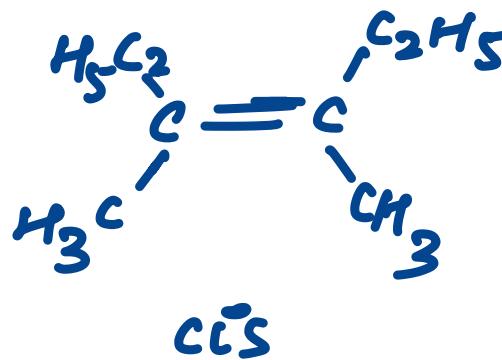
Draw *cis* and *trans* isomers of the following compounds. Also write their IUPAC names :



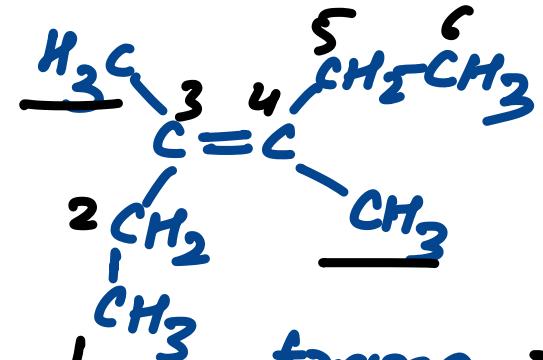
*cis*-1,2-dichloro  
ethene



*trans*-1,2-dichloroethene



*cis*



*trans*-3,4-dimethyl  
hex-3-ene

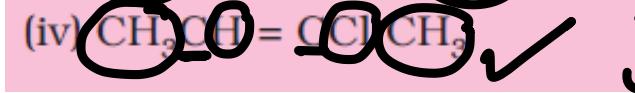
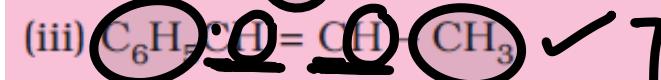
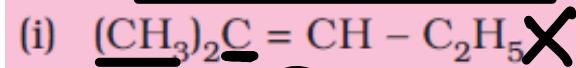


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### Problem 9.11

Which of the following compounds will show *cis-trans* isomerism?



*Double Bond*



H.W



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### Problem 9.12

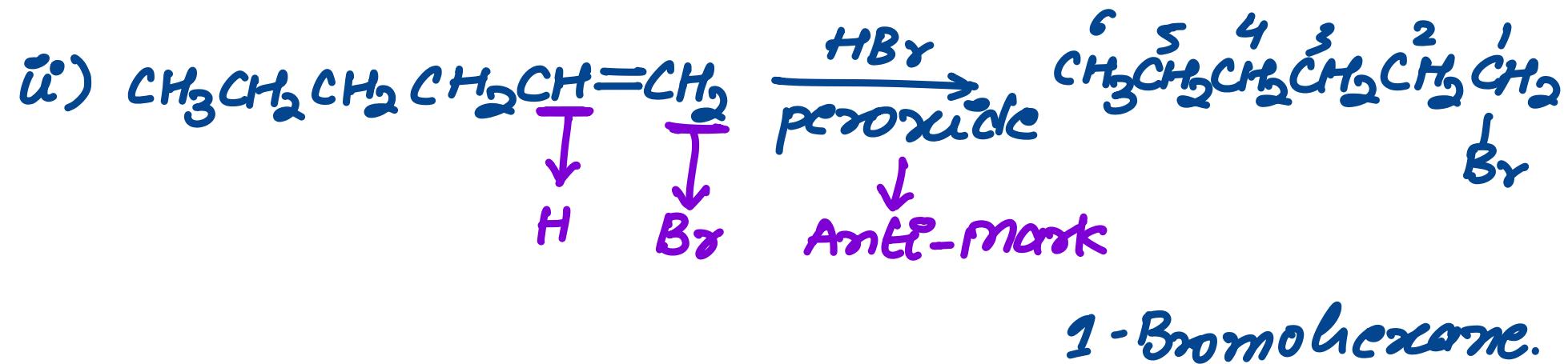
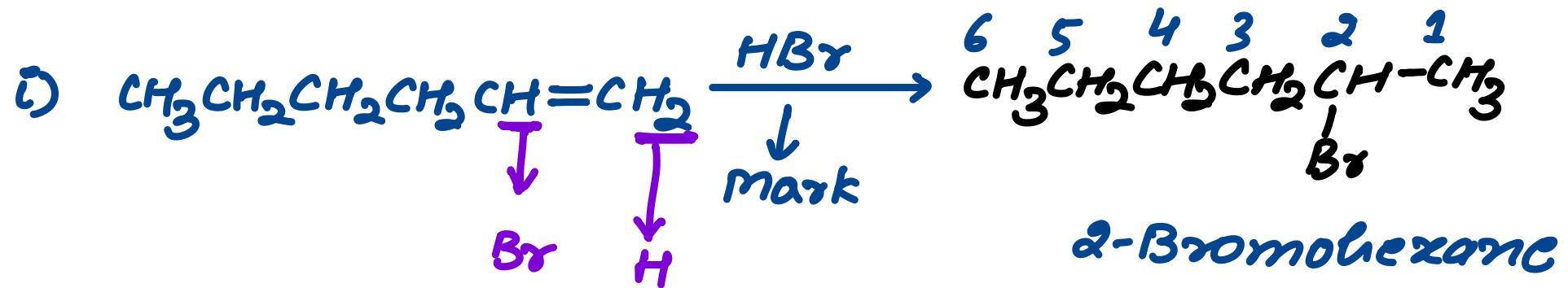
Write IUPAC names of the products obtained by addition reactions of HBr to hex-1-ene

- (i) in the absence of peroxide and
- (ii) in the presence of peroxide.



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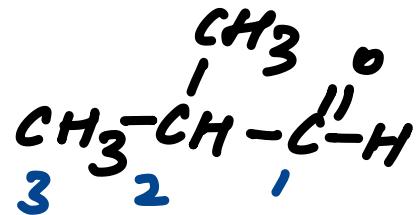


## ozonolysis.

Compound X on reaction with  $O_3$  followed by  $Zn/H_2O$  gives formaldehyde and 2-methyl propanal as products. The compound X is

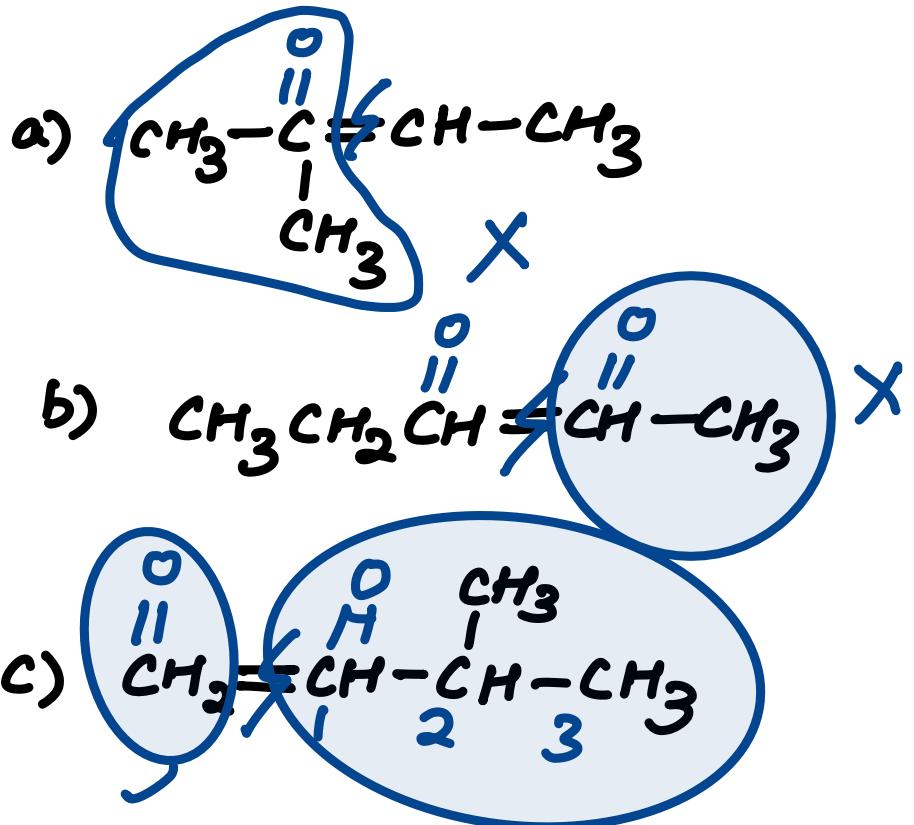
- (a) 2-Methylbut-2-ene
- (b) Pent-2-ene
- (c) 3-Methylbut-1-ene
- (d) 2-Methylbut-1-ene

(NEET 2022)



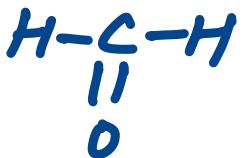
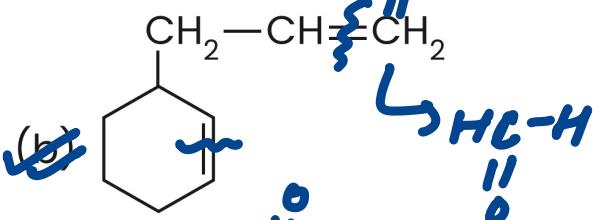
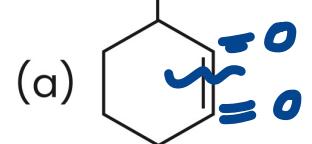
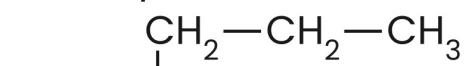
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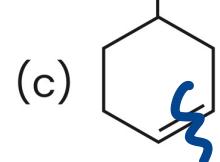
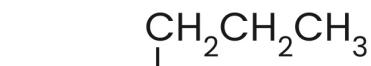
$\xrightarrow{\hspace{1cm}} \text{HCHO}$

An alkene on ozonolysis gives methanal as one of the products. Its structure is

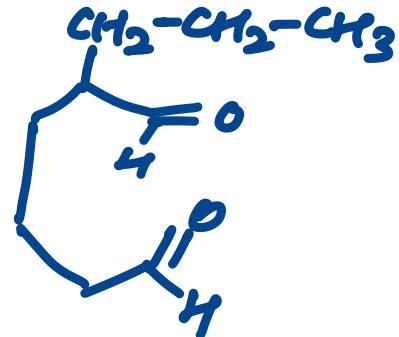


$\text{H}$

$\text{O}$



(NEET 2020)



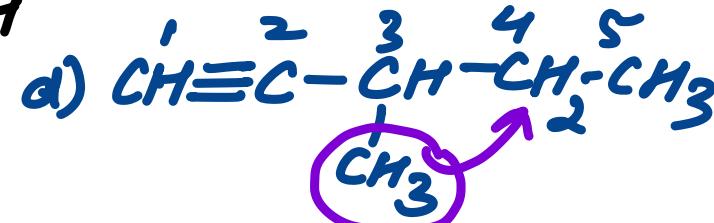
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### Problem 9.13

Write structures of different isomers corresponding to the 5<sup>th</sup> member of alkyne series. Also write IUPAC names of all the isomers. What type of isomerism is exhibited by different pairs of isomers?

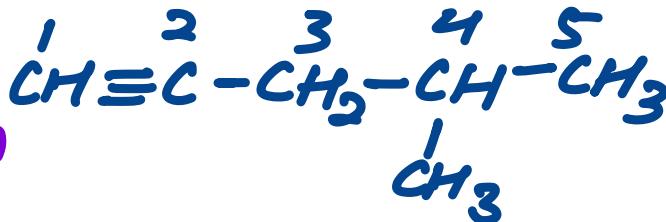
$\rightarrow C_6H_{10}$



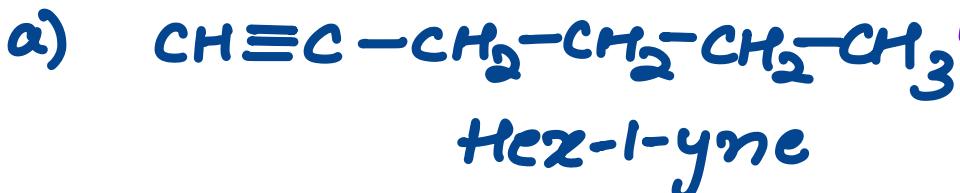
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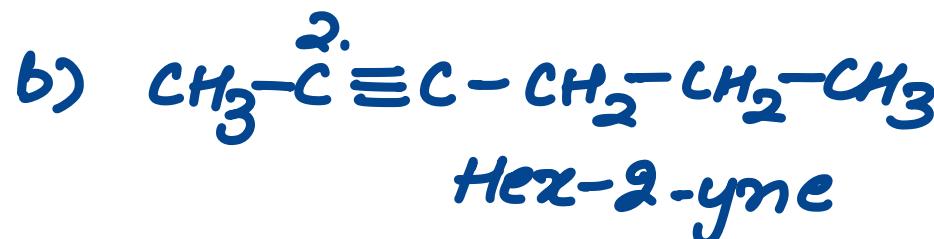
3-Methylpent-1-yne



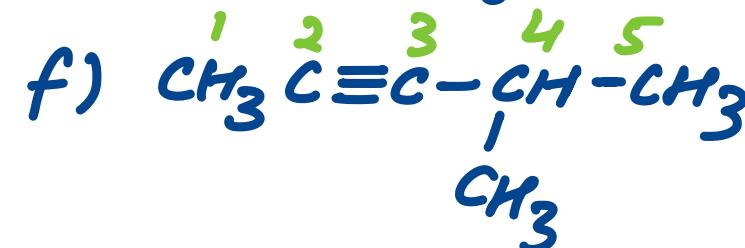
4-Methylpent-1-yne



Hex-1-yne



Hex-2-yne



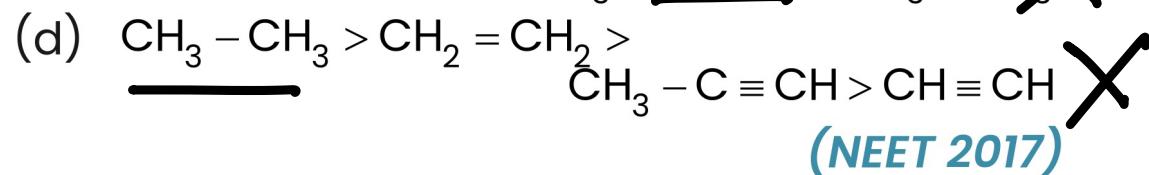
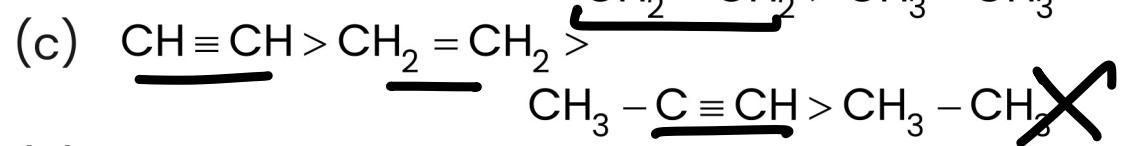
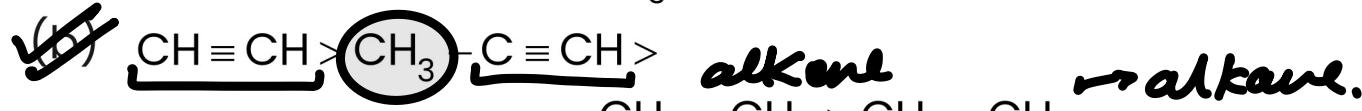
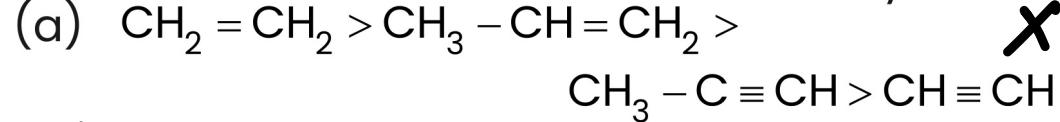
Hex-3-yne

4-Methylpent-2-yne



3,3-dimethylbut-1-yne

Which one is the correct order of acidity?



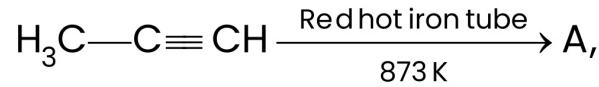
**(NEET 2017)**



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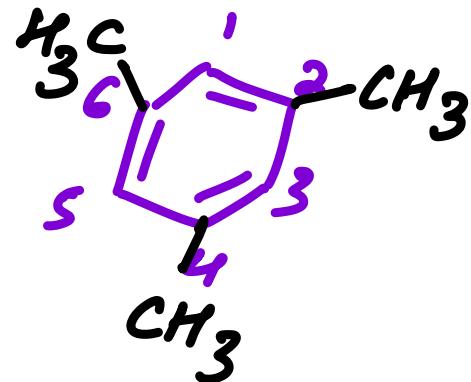
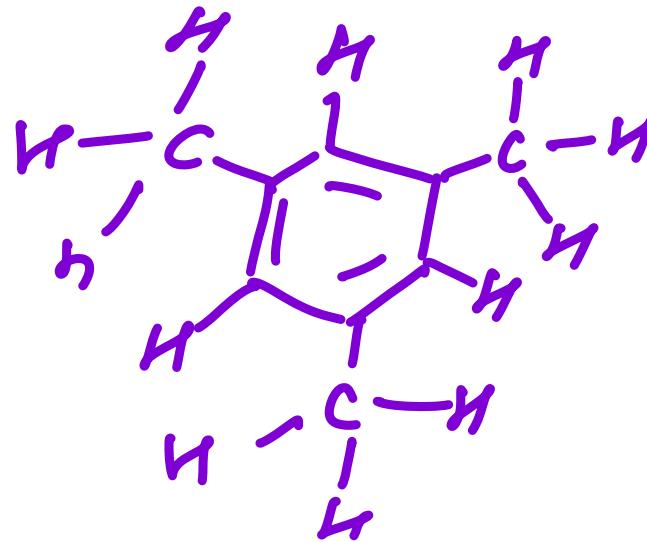
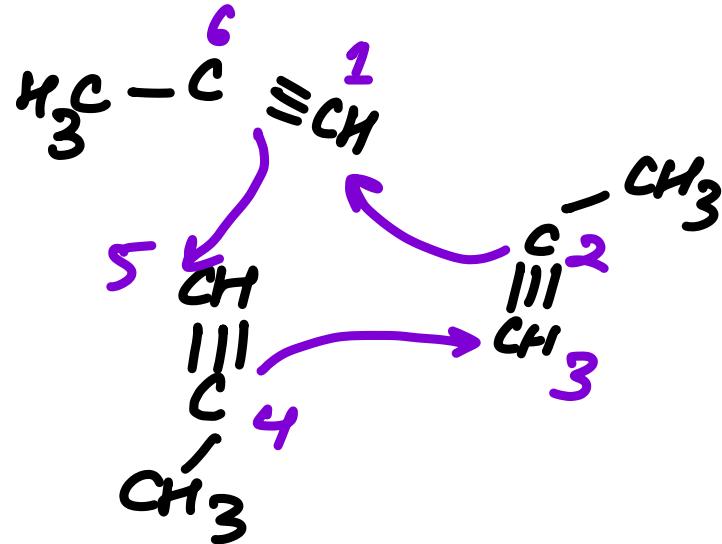
In the following reaction, *cyclic polymerisation*



the number of sigma ( $\sigma$ ) bonds present in the product A is

- ~~(a)~~ 21      (b) 9  
(c) 24      (d) 18

(Odisha NEET 2019)



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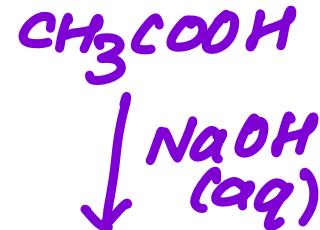
### Problem 9.14

How will you convert ethanoic acid into benzene?



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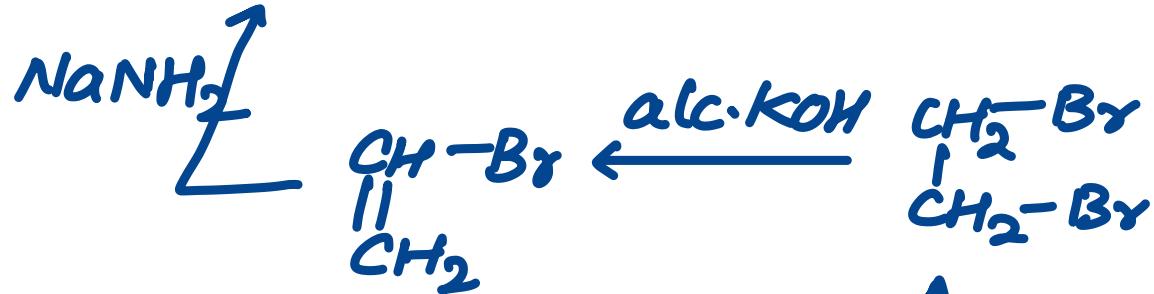
$\uparrow$  Red hot iron / 873 K  
 $\text{CH} \equiv \text{CH}$



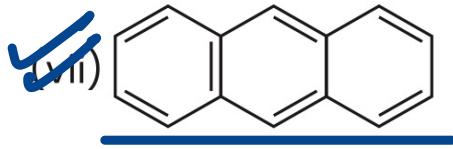
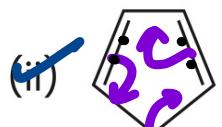
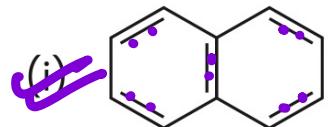
$\downarrow$  soda lime (NaOH + CaO)  
 $\Delta$  3:1



$\downarrow \text{Cl}_2/h\nu$



Consider the following compounds/species



The number of compounds/species which obey Hückel's rule is .....

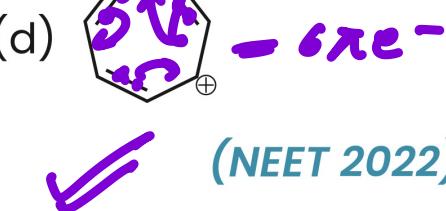
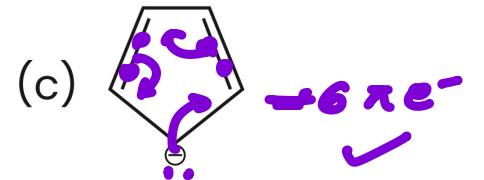
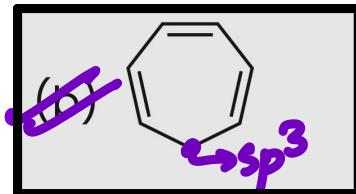
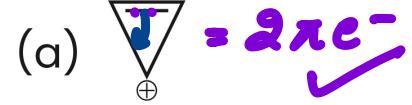
- (a) 2     $4(4n+2)\pi$     (b) 5  
(c) 4    (d) 6    (NEET 2023)



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Which compound amongst the following is not an aromatic compound?



✓ (NEET 2022)



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3Cs. 

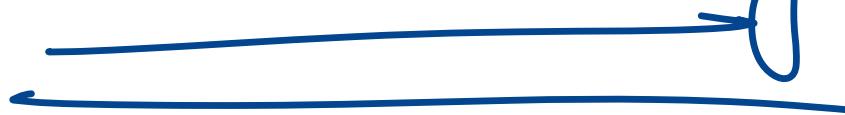
1Q Difficult.  
1Q moderate  
1Q Easy.

# The d- and f- Block



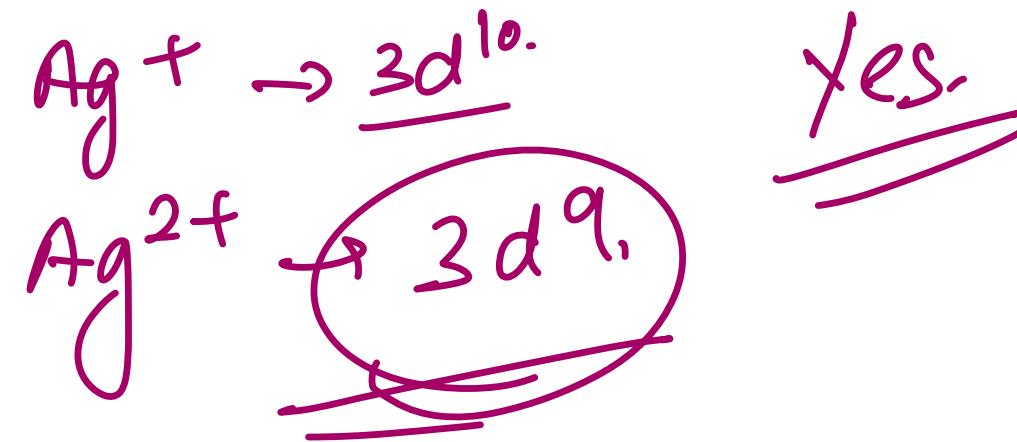
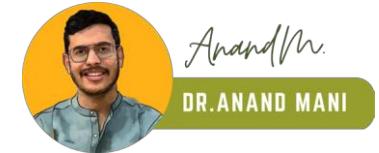
## Elements

\* Basic → Coordination Chemistry



## Intext Question

- 4.1 Silver atom has completely filled  $d$  orbitals ( $4d^{10}$ ) in its ground state. How can you say that it is a transition element?



Q The low melting point of Manganese in the first transition series is due to :-  $\frac{Mn}{3d^5 4s^2}$



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- a) Strong metallic bond due to  $d^{10}$  configuration.
- b) weak metallic bond due to  $d^5$  configuration.
- c) weak metallic bond due to  $d^7$  configuration.
- d) None.

Name a transition element which does not exhibit variable oxidation states. Example 4.3



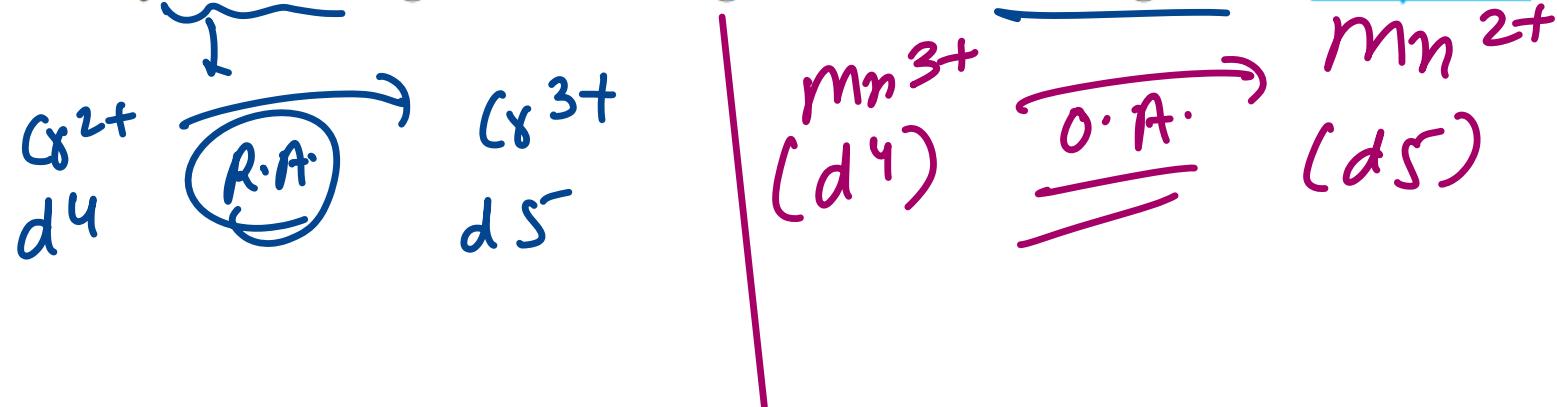
(Zn), Cd, Hg, Ln

### Intext Question

4.3 Which of the 3d series of the transition metals exhibits the largest number of oxidation states and why?

Mn.  
3d<sup>5</sup> 4s<sup>2</sup>  
T.  
highest no. of unpaired e<sup>-</sup>.

Why is  $\text{Cr}^{2+}$  reducing and  $\text{Mn}^{3+}$  oxidising when both have  $d^4$  configuration? Example 4.4



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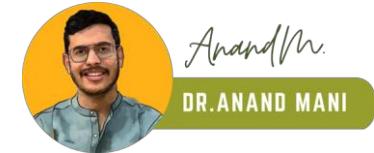
Intext Question

- 4.4 The  $E^\circ(\text{M}^{2+}/\text{M})$  value for copper is positive (+0.34V). What is possible reason for this? (Hint: consider its high  $\Delta_a H^\circ$  and low  $\Delta_{\text{hyd}} H^\circ$ )

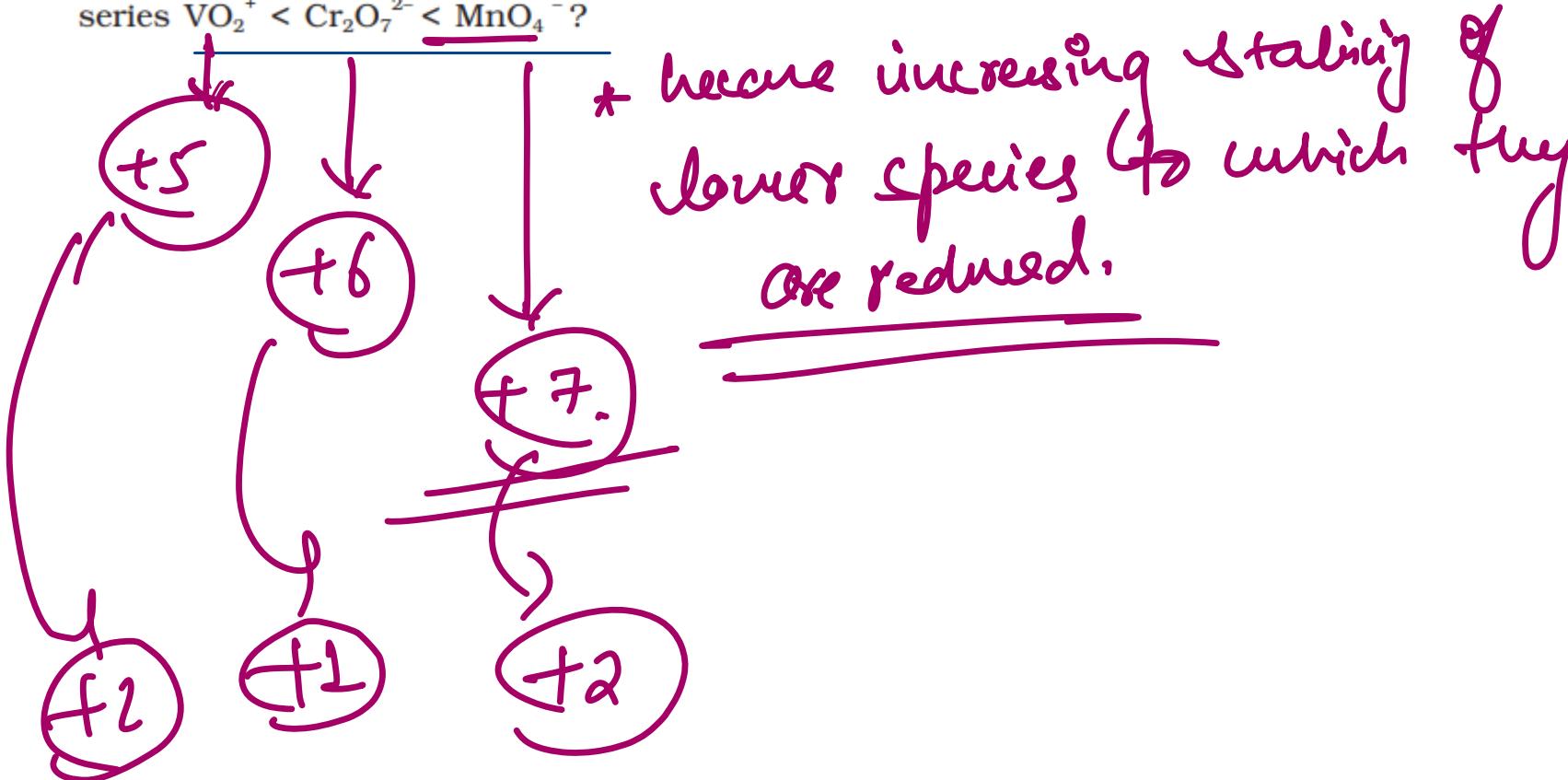
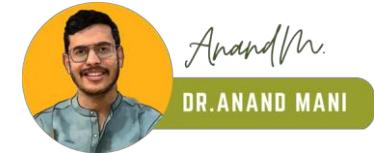
-ve H.E. does not balance DE- & S.G.

Q. The stability of  $\text{Cu}^{2+}$  is more than  $\text{Cu}^+$  salts in aqueous solution due to *Released H.E is more in case of  $\text{Cu}^{2+}$  than  $\text{Cu}^+$ .*  
(NEET 2023)

- (a) Hydration energy
- (b) Second ionisation enthalpy
- (c) First ionisation enthalpy
- (d) Enthalpy of atomization

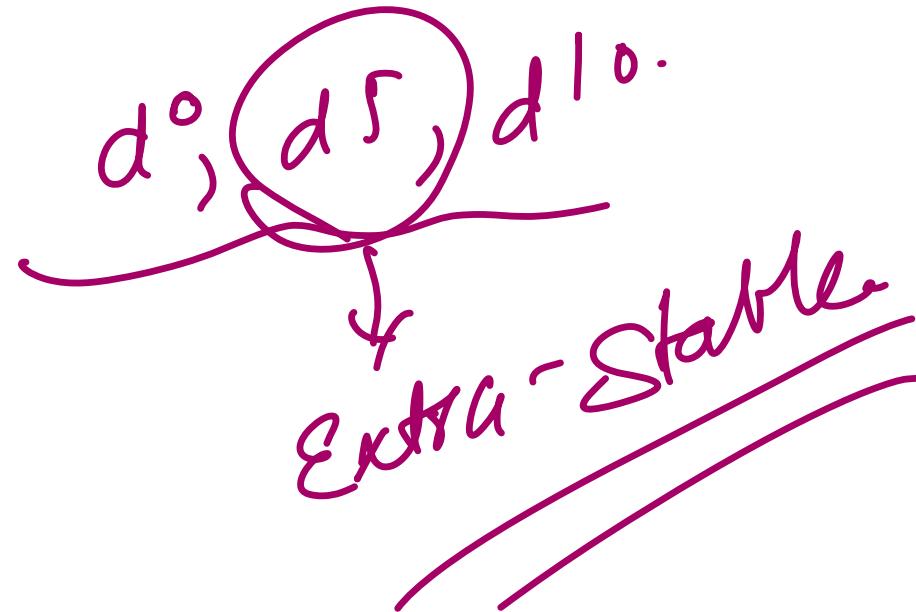
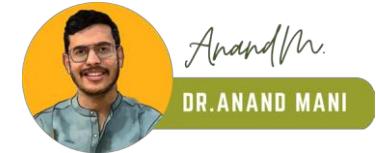


How would you account for the increasing oxidising power in the Example 4.5 series  $\text{VO}_2^+ < \text{Cr}_2\text{O}_7^{2-} < \text{MnO}_4^-$ ?



### Intext Question

- 4.5 How would you account for the irregular variation of ionisation enthalpies (first and second) in the first series of the transition elements?



Q- Which of the following statements are INCORRECT?

- A. All the transition metals except scandium form MO oxides which are ionic. ✓
- B. The highest oxidation number corresponding to the group number in transition metal oxides is attained in  $\text{Sc}_2\text{O}_3$  to  $\text{Mn}_2\text{O}_7$ . ✓
- C. Basic character increases from  $\text{V}_2\text{O}_3$  to  $\text{V}_2\text{O}_4$  to  $\text{V}_2\text{O}_5$ . +5 (Amphoteric)
- D.  $\text{V}_2\text{O}_4$  dissolves in acids to give  $\text{VO}_4^{3-}$  salts. ✗
- E.  $\text{CrO}$  is basic but  $\text{Cr}_2\text{O}_3$  is amphoteric. ✓

O.S. & acidity

Choose the correct answer from the options given below:

(NEET 2023)

- (a) C and D only
- (b) B and C only
- (c) A and E only
- (d) B and D only



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### Example 4.6

For the first row transition metals the  $E^\circ$  values are:

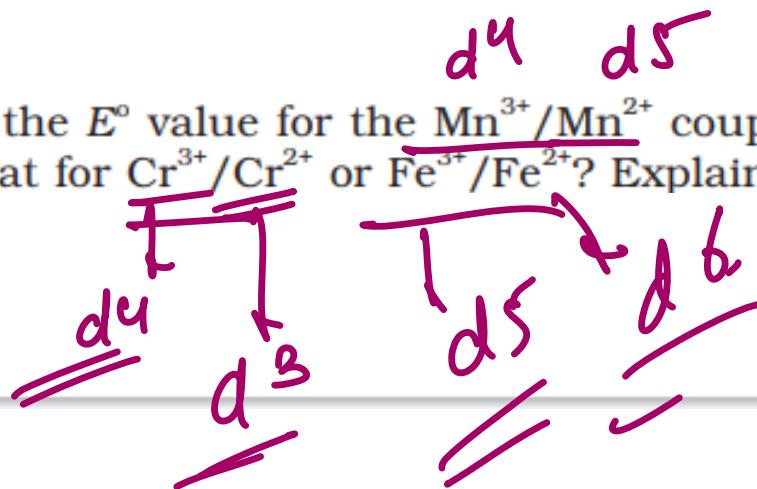
$E^\circ$ ( $M^{2+}/M$ )	V	Cr	Mn	Fe	Co	Ni	Cu
-1.18	-0.91	-1.18	-0.44	-0.28	-0.25	+0.34	

Explain the irregularity in the above values.

ionisation E + sub. G + lig.

### Example 4.7

Why is the  $E^\circ$  value for the  $Mn^{3+}/Mn^{2+}$  couple much more positive than that for  $Cr^{3+}/Cr^{2+}$  or  $Fe^{3+}/Fe^{2+}$ ? Explain.



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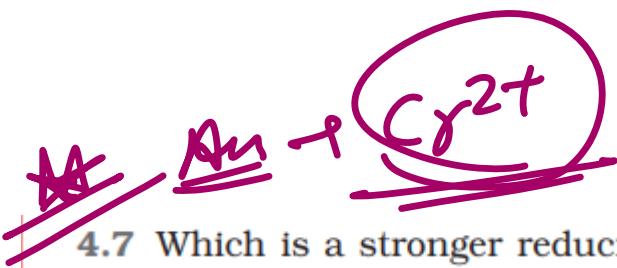
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### Intext Questions

4.6 Why is the highest oxidation state of a metal exhibited in its oxide or fluoride only?

\* Strong O.A.  
\* E.n. Elements.

+ Ionic.  $\rightarrow$  High L.G.

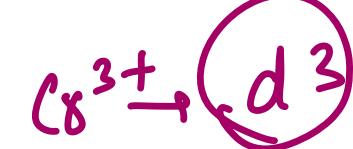


Caquelous)

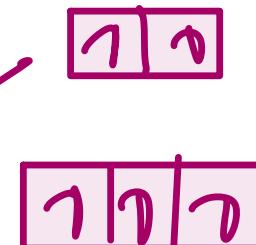
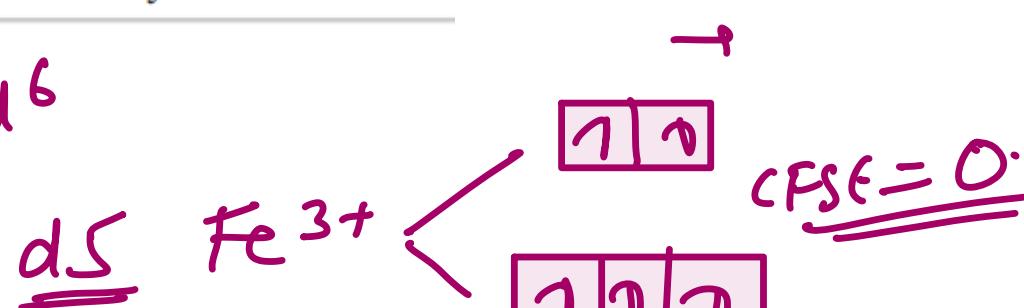
4.7 Which is a stronger reducing agent  $\text{Cr}^{2+}$  or  $\text{Fe}^{2+}$  and why?



Easy,



$\text{CFSE} = -1.204$



$\text{CFSE} = 0$

Calculate the magnetic moment of a divalent ion in aqueous solution if its atomic number is 25.



$$n = 5$$

1	1	1	1	1
---	---	---	---	---

$$\begin{aligned}\mu &= \sqrt{n(n+2)} \\ &= \sqrt{5(7)} \\ &= \underline{\sqrt{35}} = \underline{5.92 \text{ BM}}\end{aligned}$$

### Example 4.8



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### Intext Question

4.8 Calculate the 'spin only' magnetic moment of  $M^{2+}_{(\text{aq})}$  ion ( $Z = 27$ ).



1	1	1	1	1
---	---	---	---	---

$$n = 3$$

$$\begin{aligned}\mu &= \sqrt{n(n+2)} \\ &= \sqrt{3(5+3)} \\ &= \underline{\sqrt{15}} = \underline{3.87 \text{ BM}}\end{aligned}$$

Q- Match the metal ions given in Column I with the spin magnetic moments of the ions given in Column II and assign the correct code :



(NEET 2018)

- (a) 1-iv, 2-I, 3-ii, 4-iii ✗
- (b) 1-I, 2-ii, 3-iii, 4-iv ✗
- (c) 1-iv, 2-v, 3-ii, 4-i
- (d) 1-iii, 2-v, 3-I, 4-ii ✗

	Column I	Column II
1	$\text{Co}^{3+}$ $d^6$ $\rightarrow n=4$	i. $\sqrt{8}\text{BM}$
2	$\text{Cr}^{3+}$ $d^3$ $\rightarrow n=3$	ii. $\sqrt{35}\text{BM}$
3	$\text{Fe}^{3+}$ $d^5$ $\rightarrow n=5$	iii. $\sqrt{3}\text{BM}$
4	$\text{Ni}^{2+}$ $(d^8)$	iv. $\sqrt{24}\text{BM}$
	$n=2$	v. $\sqrt{15}\text{BM}$

**Table 4.8: Colours of Some of the First Row (aquated) Transition Metal Ions**



Configuration	Example	Colour
3d <sup>0</sup>	Sc <sup>3+</sup>	colourless
3d <sup>0</sup>	Ti <sup>4+</sup>	colourless
3d <sup>1</sup>	Ti <sup>3+</sup>	purple
3d <sup>1</sup>	V <sup>4+</sup>	blue
3d <sup>2</sup>	V <sup>3+</sup>	green
3d <sup>3</sup>	V <sup>2+</sup>	violet
3d <sup>3</sup>	Cr <sup>3+</sup>	violet
3d <sup>4</sup>	Mn <sup>3+</sup>	violet
3d <sup>4</sup>	Cr <sup>2+</sup>	blue
3d <sup>5</sup>	Mn <sup>2+</sup>	pink (light)
3d <sup>5</sup>	Fe <sup>3+</sup>	yellow
3d <sup>6</sup>	Fe <sup>2+</sup>	green
3d <sup>6</sup> 3d <sup>7</sup>	Co <sup>3+</sup> Co <sup>2+</sup>	bluepink
3d <sup>8</sup>	Ni <sup>2+</sup>	green
3d <sup>9</sup>	Cu <sup>2+</sup>	blue
3d <sup>10</sup>	Zn <sup>2+</sup>	colourless



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Note: Permanganate titrations in presence of hydrochloric acid are unsatisfactory since hydrochloric acid is oxidised to chlorine.



*Read & Learn*

Uses: Besides its use in analytical chemistry, potassium permanganate is used as a favourite oxidant in preparative organic chemistry. Its uses for the bleaching of wool, cotton, silk and other textile fibres and for the decolourisation of oils are also dependent on its strong oxidising power.

Q- The manganate and permanganate ions are tetrahedral, due to

(NEET 2019)



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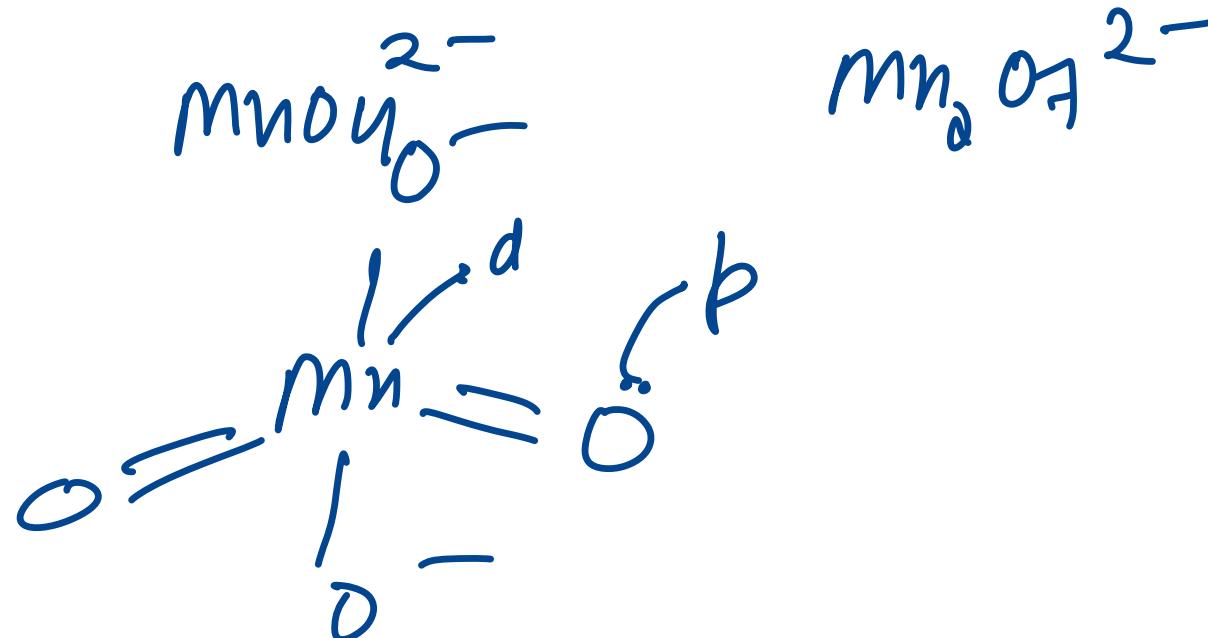
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(a) there is no  $\pi$ -bonding ~~X~~

(b) the  $\pi$  -bonding involves overlap of p-orbitals of oxygen with p-orbitals of manganese ~~X~~

(c) the  $\pi$  -bonding involves overlap of d-orbitals of oxygen with d-orbitals of manganese ~~X~~

(d) the  $\pi$  -bonding involves overlap of p-orbitals of oxygen with d-orbitals of manganese \_\_\_\_\_



Q- The incorrect statement among the following is

(NEET 2021)



- (a) actinoid contraction is greater for element to element than lanthanoid contraction ~~✓~~
- (b) most of the trivalent lanthanoid ions are colourless in the solid state. ~~✗~~
- (c) lanthanoids are good conductors of heat and electricity. ~~✓~~
- (d) actinoids are highly reactive metals, especially when finely divided. ~~✓~~

→ Gd<sub>64</sub> → 4f<sup>7</sup>

Q- Gadolinium belongs to 4f series. Its atomic number is 64. Which of the following is the correct electronic configuration of gadolinium?



(AIPMT 2015)

- (a) Xe 4f<sup>8</sup> 6d<sup>2</sup> ~~X~~
- (b) Xe 4f<sup>9</sup> 5s<sup>1</sup> ~~X~~
- (c) Xe 4f<sup>7</sup> 5d<sup>1</sup> 6s<sup>2</sup>
- (d) Xe 4f<sup>6</sup> 5d<sup>2</sup> 6s<sup>2</sup> ~~X~~

54 + 10

# Coordination Compounds



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o 3Q.

→ Isomerism.

→ ligands

→ CFT → application.

→ Energy. (λ)

→ Magnetism.

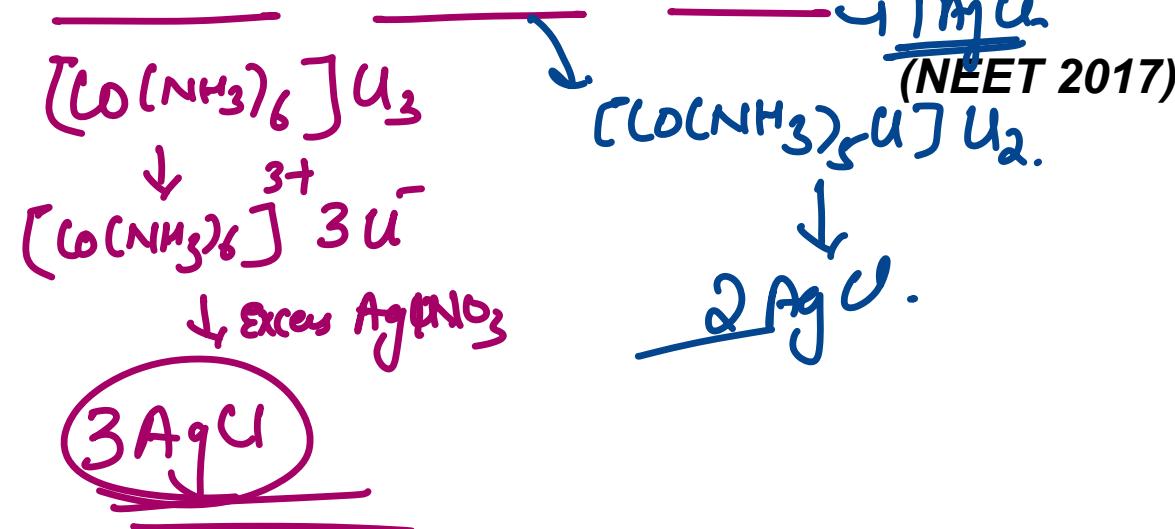
→ Geometry.

Q- The correct order of the stoichiometries of AgCl formed when AgNO<sub>3</sub> in excess

is treated with the complexes: CoCl<sub>3</sub>.6NH<sub>3</sub>, CoCl<sub>3</sub>.5NH<sub>3</sub>, CoCl<sub>3</sub>.4NH<sub>3</sub> respectively is

\* CN = 6

- (a) 1AgCl, 3AgCl, 2AgCl
- (b) 3AgCl, 1AgCl, 2AgCl
- (c) 3AgCl, 2AgCl, 1AgCl
- (d) 2AgCl, 3AgCl, 1AgCl



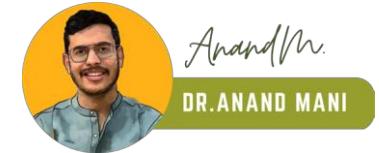
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Q- Ethylene diaminetetraacetate (EDTA) ion is

**(NEET 2021)**

- (a) hexadentate ligand with four O and two N donor atoms
- (b) unidentate ligand
- (c) bidentate ligand with two N donor atoms
- (d) tridentate ligand with three N donor atoms



Q- Which complex compound is most stable?

- \* Chelate:
- (a)  $[\text{CoCl}_2(\text{en})_2]\text{NO}_3$
- (b)  $[\text{Co}(\text{NH}_3)_6]_2(\text{SO}_4)_3$
- (c)  $[\text{Co}(\text{NH}_3)_4(\text{H}_2\text{O})\text{Br}](\text{NO}_3)_2$
- (d)  $[\text{Co}(\text{NH}_3)_3(\text{NO}_3)_3]$

(NEET 2023)



Q- Homoleptic complex from the following complexes is

(NEET 2023)



- $\text{NH}_3$   $\text{CO}_3^{2-}$
- $\text{NH}_3$   $\text{H}_2\text{O}$
- $\text{CrO}_4^{2-}$
- $\text{NH}_3$   $\text{U}$   $\text{NO}_2$
- (a) Pentaamminecarbonatocobalt (III) chloride
  - (b) Triamminetriaquachromium (III) chloride
  - (c) Potassium trioxalatoaluminate (III)
  - (d) Diamminechloridonitrito-N-platinum (II)

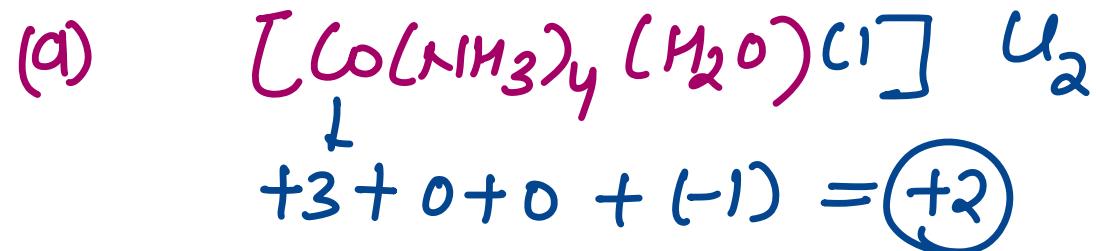
Example 5.2 Write the formulas for the following coordination compounds:

- (a) Tetraammineaquachloridocobalt(III) chloride
- (b) Potassium tetrahydroxidozincate(II)
- (c) Potassium trioxalatoaluminate(III)
- (d) Dichloridobis(ethane-1,2-diamine)cobalt(III)  $\rightarrow$   $[\text{Co}(\text{en})_2\text{Cl}_2]^{+1}$
- (e) Tetracarbonylnickel(0)



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$$\begin{aligned} & \downarrow \\ & +3 + (-2) + 0 \\ & = +1 \end{aligned}$$

$\leftarrow \text{NO}_2$  (Nitrito- $\pi$ )

$\leftarrow \text{OND}$  (Nitido- $\text{O}$ )

Example 5.3 Write the IUPAC names of the following coordination compounds:



$$x + (0) + (-1) + (-1) = 0$$

Diamminechloridonitido-N-platinum(II).



$$x + (-1x)2 + 0 = +1$$

$$\underline{\underline{x = +3}}$$

Dichlorido bis(ethylenediamine) cobalt(III) chloride.



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## Intext Questions



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5.1 Write the formulas for the following coordination compounds:

(i) Tetraamminediaquacobalt(III) chloride  $[\text{Co}(\text{NH}_3)_4(\text{H}_2\text{O})_2] \text{Cl}_3$

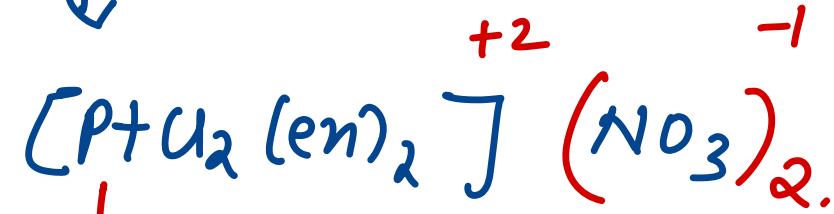
(ii) Potassium tetracyanidonickelate(II)

(iii) Tris(ethane-1,2-diamine) chromium(III) chloride  $\rightarrow [\text{Cr}(\text{en})_3] \text{Cl}_3$

(iv) Amminebromidochloridonitrito-N-platinato(II)

(v) Dichloridobis(ethane-1,2-diamine)platinum(IV) nitrate

(vi) Iron(III) hexacyanidoferrate(II)



$$+4 + (-2) =$$

$$\underline{\underline{+2}}$$



$$+3$$

$$+2 + (-6) = +4$$



## 5.2 Write the IUPAC names of the following coordination compounds:



$$\begin{array}{rcl} \text{(i)} & \mathfrak{X} + 0 & = +3 \\ & \mathfrak{X} = +3 & \end{array}$$

Hexaamminecobalt(III)  
chloride.



$$\begin{array}{l} \downarrow \\ \mathfrak{X} + (-4) = -2 \\ \mathfrak{X} = +2. \end{array}$$

Potassium tetrachlorido palladate(II)



$$\begin{array}{l} \mathfrak{X} + (0) + (-1) + 0 = +1 \\ \mathfrak{X} = +2. \end{array}$$

Diamminechlorido(methylamine)platinum(II) chloride.

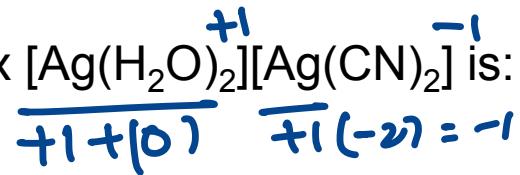
why Bracket?



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Q- The IUPAC name of the complex  $[\text{Ag}(\text{H}_2\text{O})_2][\text{Ag}(\text{CN})_2]$  is:



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(NEET 2022)

- (a) dicyanidosilver (I) diaquaargentate (I)
- (b) diaquasilver (I) dicyanidoargentate (I)
- (c) dicyanidosilver (II) diaquaargentate (II)
- (d) diaquasilver (II) dicyanidoargentate (II)

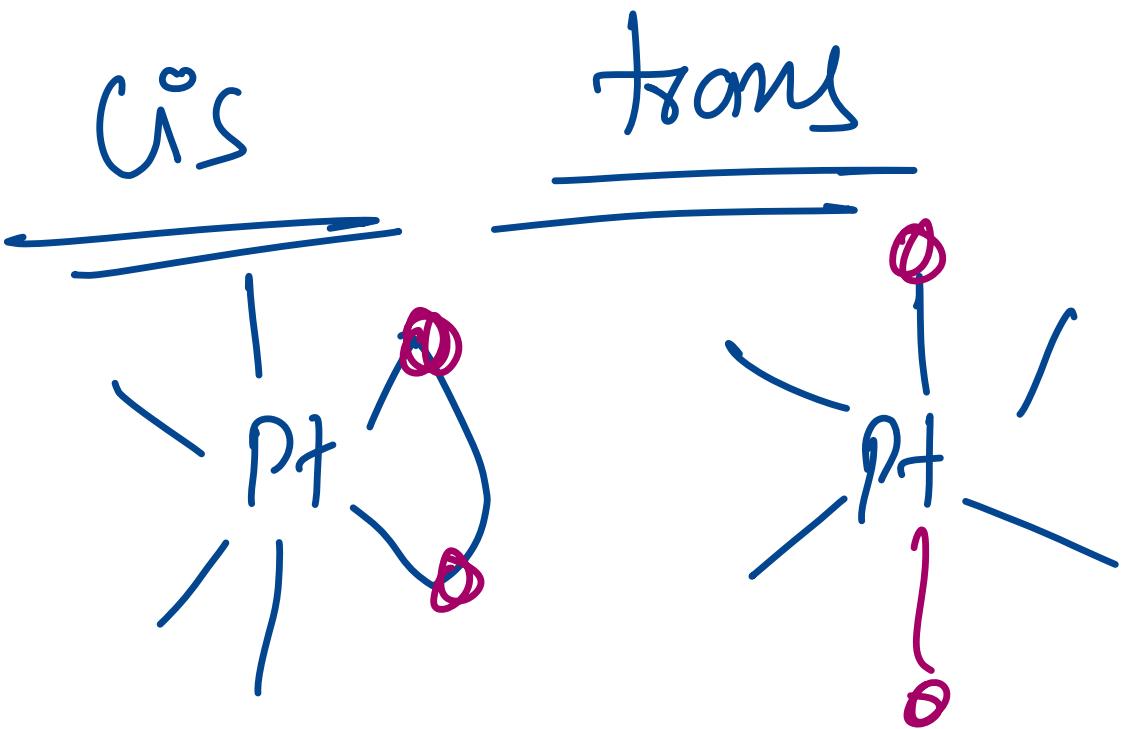
**Example 5.5** Draw structures of geometrical isomers of  $[\text{Fe}(\text{NH}_3)_2(\text{CN})_4]^-$



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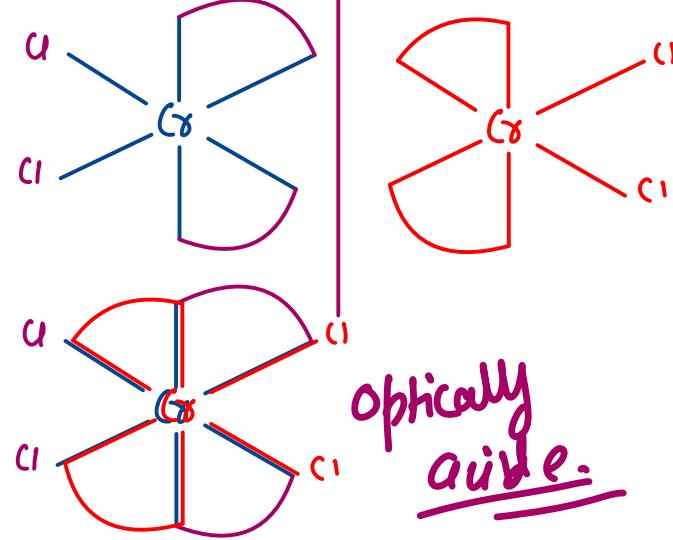
May.



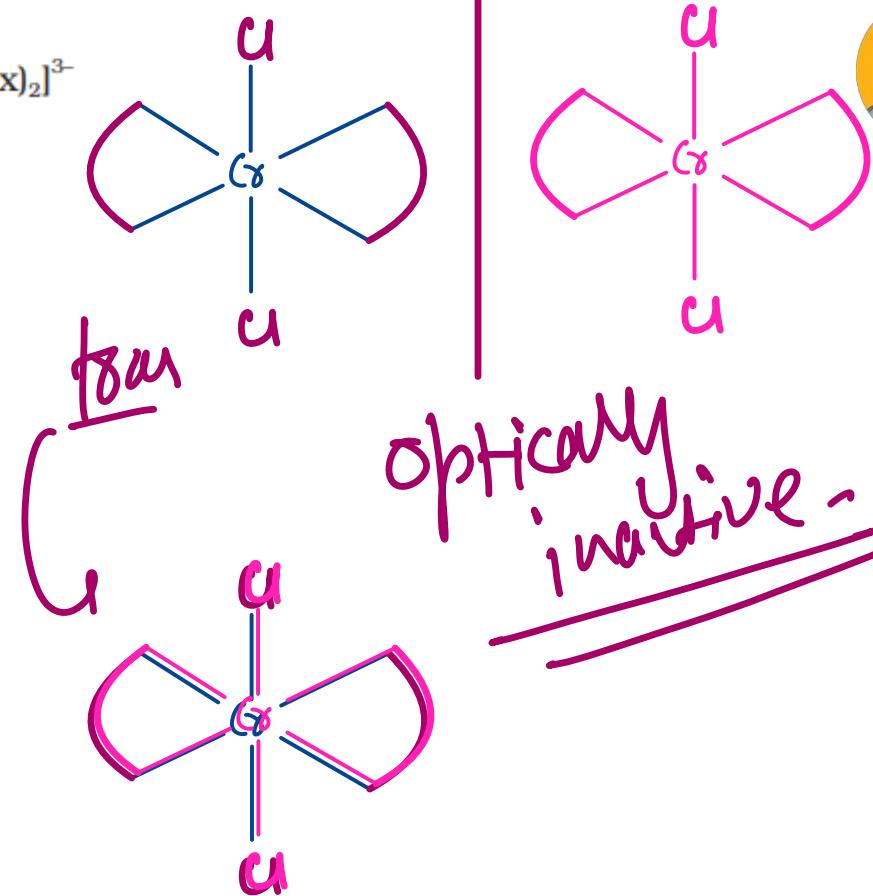
### Example 5.6

Out of the following two coordination entities which is chiral (optically active)?

(a)  $\text{cis-}[\text{CrCl}_2(\text{ox})_2]^{3-}$   
bidentate



(b)  $\text{trans-}[\text{CrCl}_2(\text{ox})_2]^{3-}$



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The type of isomerism shown by the complex  $[\text{CoCl}_2(\text{en})_2]$  is

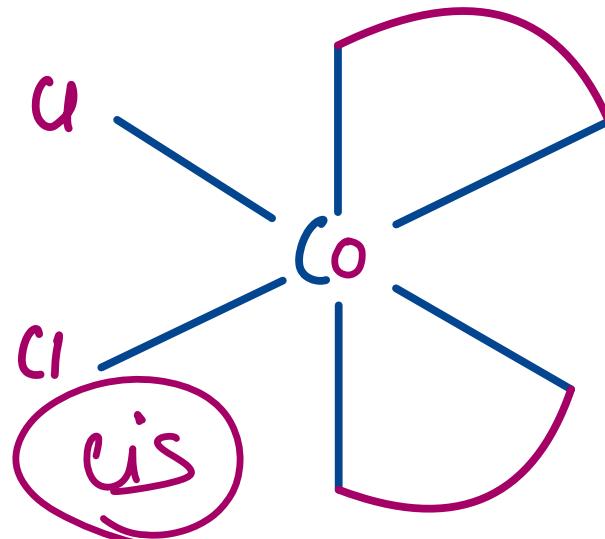
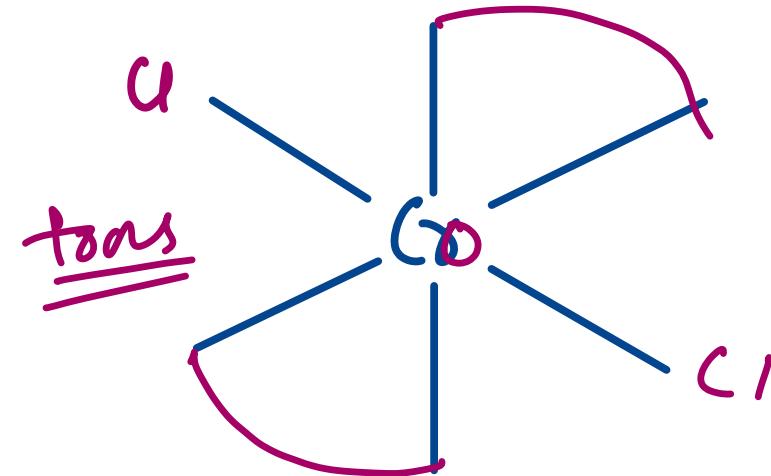


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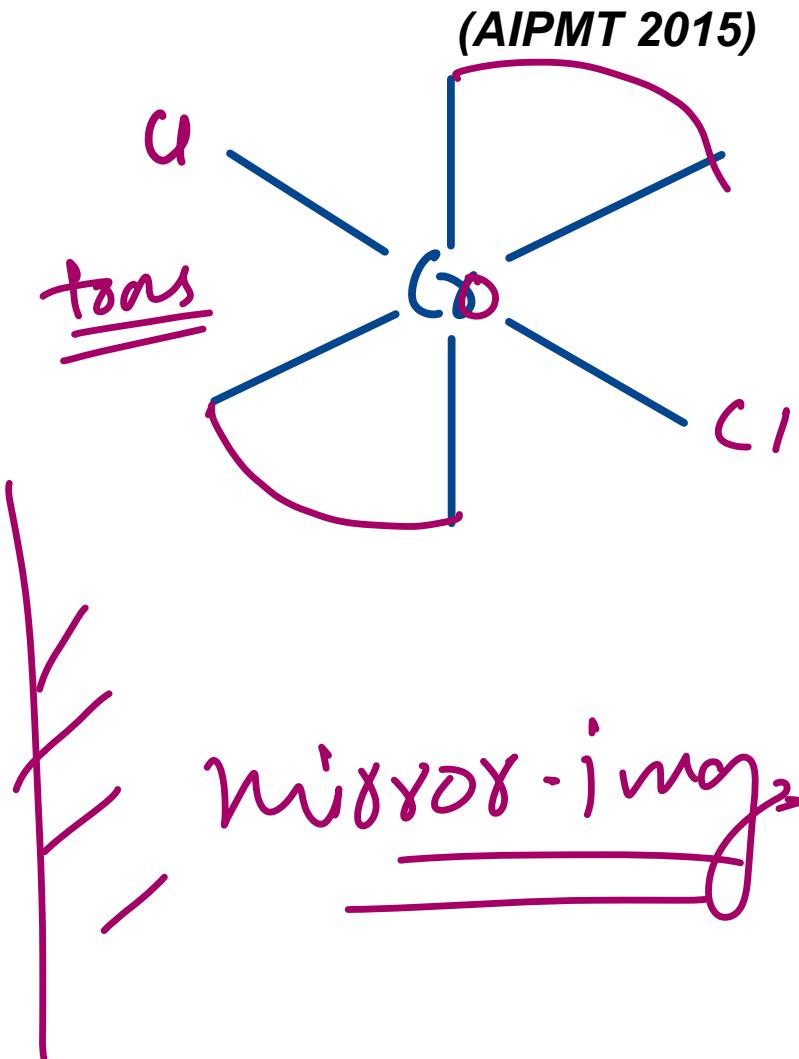
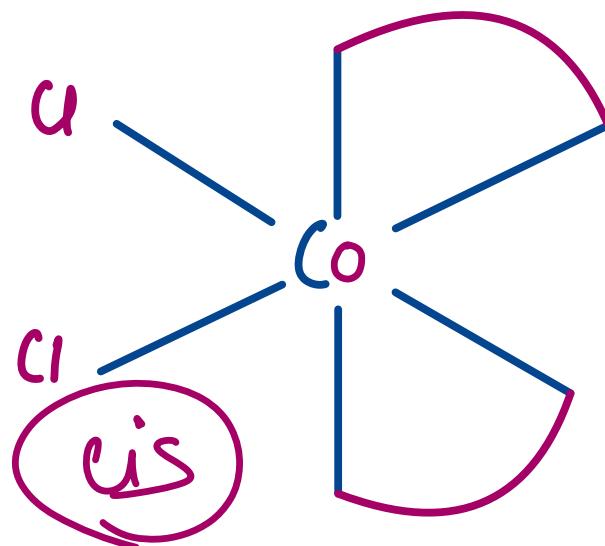
(NEET 2018)

- (a) ionisation isomerism
- (b) coordination isomerism
- (c) geometrical isomerism
- (d) linkage isomerism



Q- Number of possible isomers for the complex  $[\text{Co}(\text{en})_2\text{Cl}_2]\text{Cl}$  will be

- (a) 2
- (b) 1
- (c) 3
- (d) 4



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### Example 5.7

The spin only magnetic moment of  $[\text{MnBr}_4]^{2-}$  is 5.9 BM. Predict the geometry of the complex ion?

~~Td~~



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CN=4.  
 $\mu = 5.9.$

~~Td (No pairing)~~

Sq. Planar. (Paired)

$\text{Mn}^{2+} \rightarrow d^5$

$\begin{array}{|c|c|c|c|c|} \hline \gamma_L & \gamma_L & \gamma & \gamma & \gamma \\ \hline \end{array}$

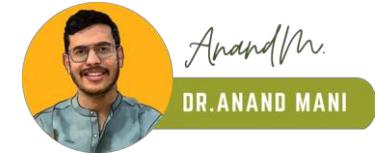
~~dsp<sup>2</sup>~~

$\begin{array}{|c|c|c|c|c|} \hline \gamma & \gamma & \gamma & \gamma & \gamma \\ \hline \end{array}$

$\text{SP}^3$

$\mu = 5.9. = \sqrt{n(n+2)}$

Q- What is the correct electronic configuration of the central atom in  $K_4[Fe(CN)_6]$  based on crystal field theory?



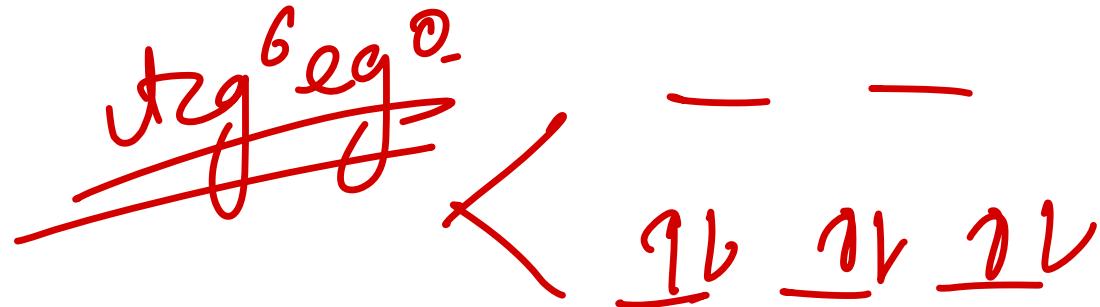
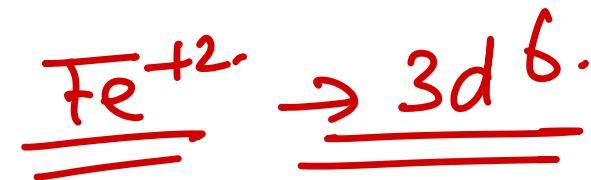
- (a)  $t_2g^6eg^0$
- (b)  $e^3t_2^3$
- (c)  $e^4t_2^2$
- (d)  $t_2g^4eg^2$

$$x + (-6) = +4$$

$$x = +2.$$
  

---

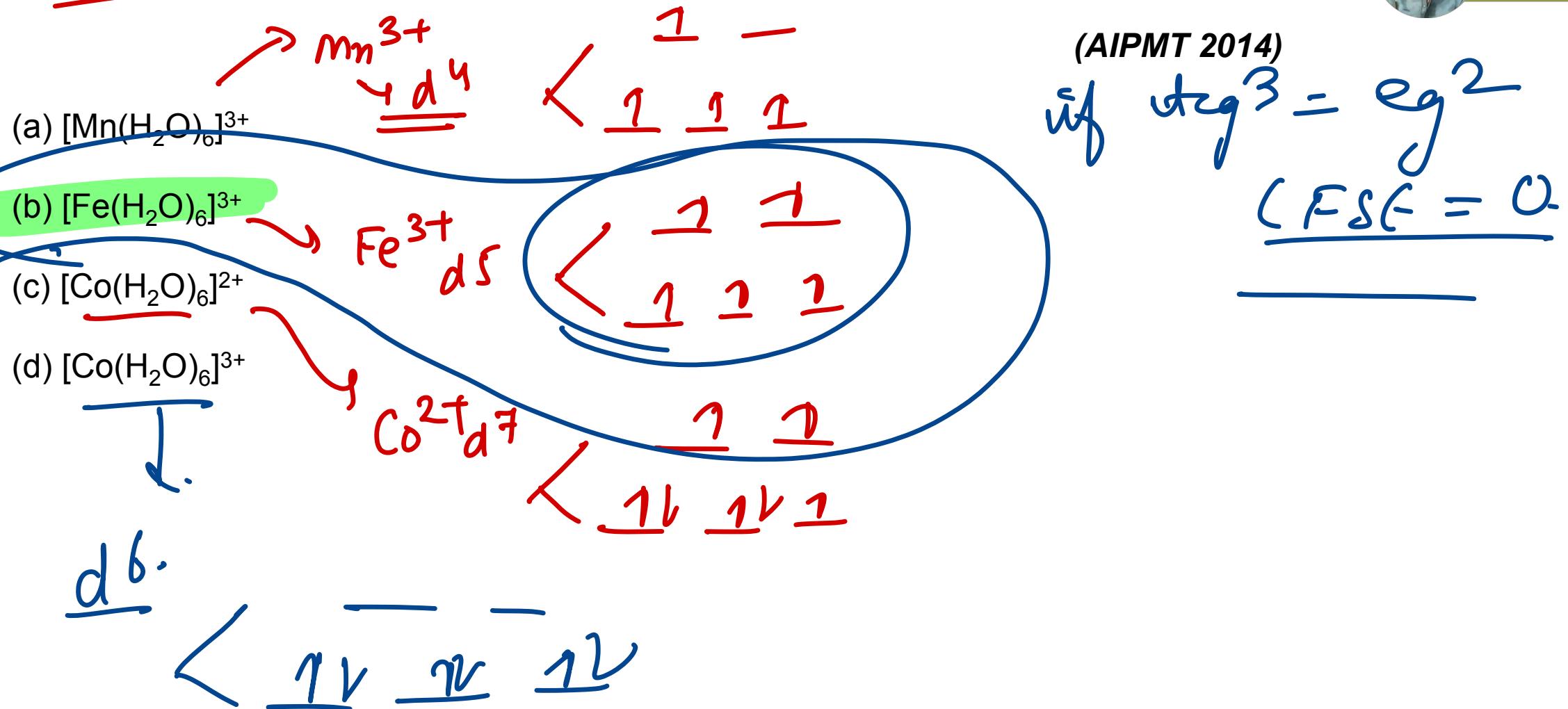
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(NEET 2019)



Q- Among the following complexes, the one which shows zero crystal field stabilisation energy (CFSE) is



Q- Match List-I with List-II.

Choose the correct answer from the options given below

(NEET 2021)

(a) A-4, B-2, C-1, D-3

(b) A-2, B-4, C-3, D-1

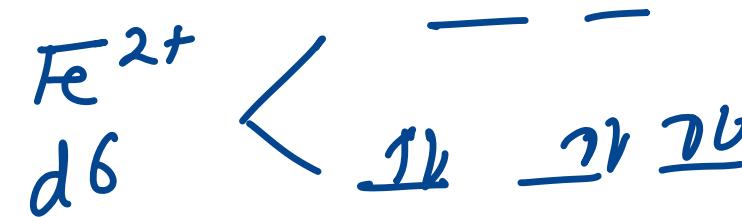
(c) A-1, B-3, C-4, D-2

(d) A-4, B-1, C-2, D-3

unpaired  $e^-$   
 $n = ?$

$\sqrt{n(n+L)} \text{ BM.}$

	List-I		List-II
A.	$[\text{Fe}(\text{CN})_6]^{3-}$	1.	5.92 BM
B.	$[\text{Fe}(\text{H}_2\text{O})_6]^{3+}$ $n=5.$	2.	0 BM
C.	$[\text{Fe}(\text{CN})_6]^{4-}$ $n=0$	3.	4.90 BM
D.	$[\text{Fe}(\text{H}_2\text{O})_6]^{2+}$	4.	1.73 BM



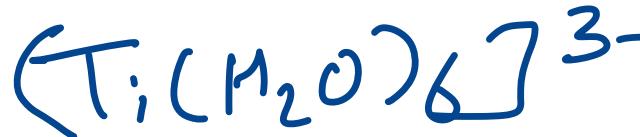
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- It is important to note that in the absence of ligand, crystal field splitting does not occur and hence the substance is colourless. For example, removal of water from  $[\text{Ti}(\text{H}_2\text{O})_6]\text{Cl}_3$  on heating renders it colourless.

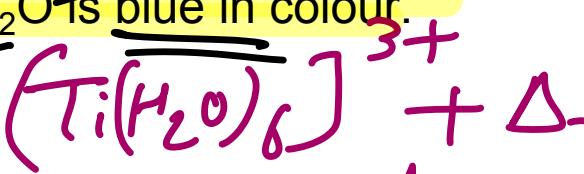
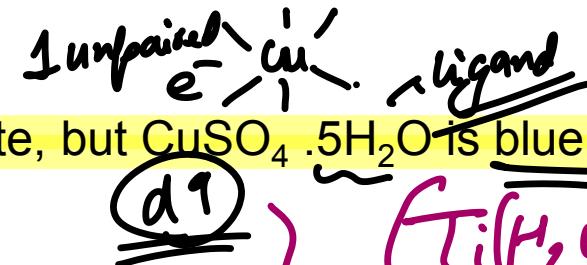


- Similarly, anhydrous  $\text{CuSO}_4$  is white, but  $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$  is blue in colour.



*violet*

1		
---	--	--



*Colourless*

1				
---	--	--	--	--

➤ The influence of the ligand on the colour of a complex may be illustrated by considering the  $[\text{Ni}(\text{H}_2\text{O})_6]^{2+}$  complex, which forms when nickel(II) chloride is dissolved in water. If the didentate ligand, ethane-1,2-diamine(en) is progressively added in the molar ratios en:Ni, 1:1, 2:1, 3:1, the following series of reactions and their associated colour changes occur:

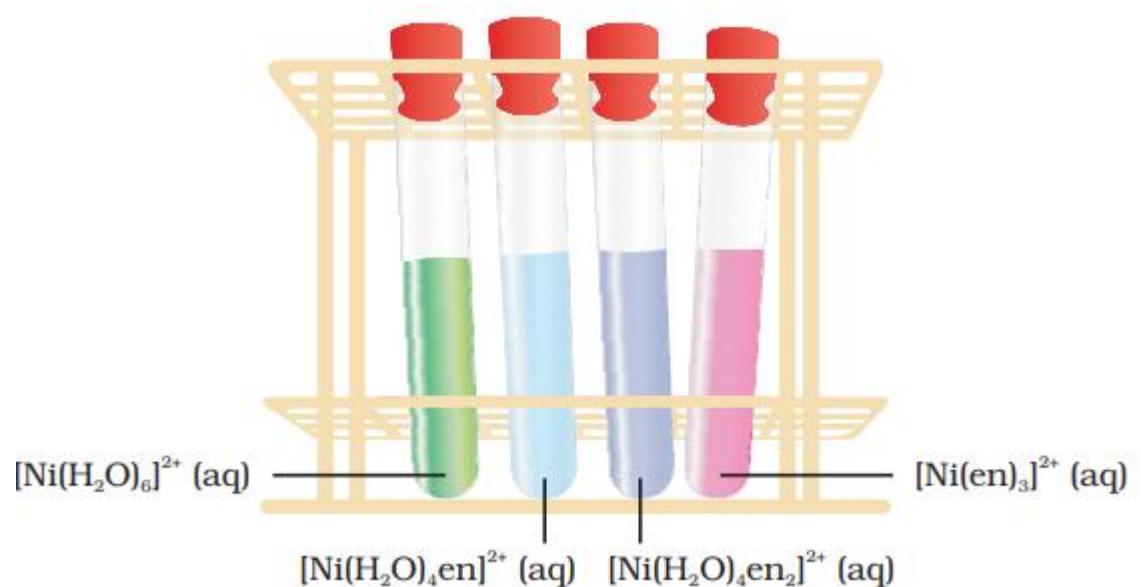
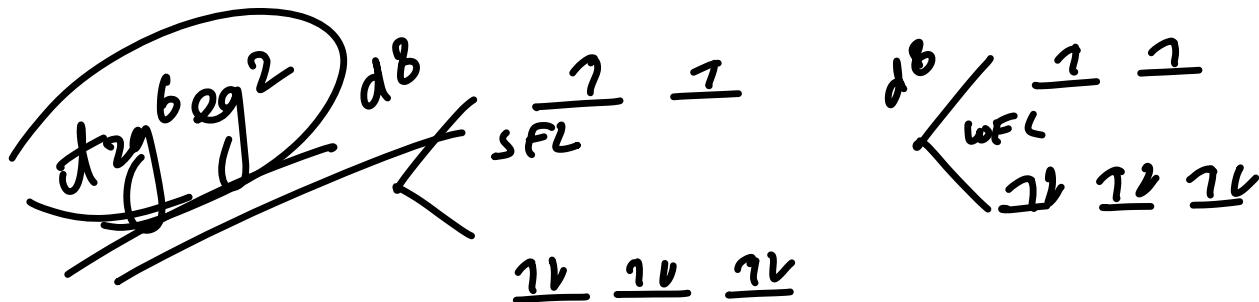
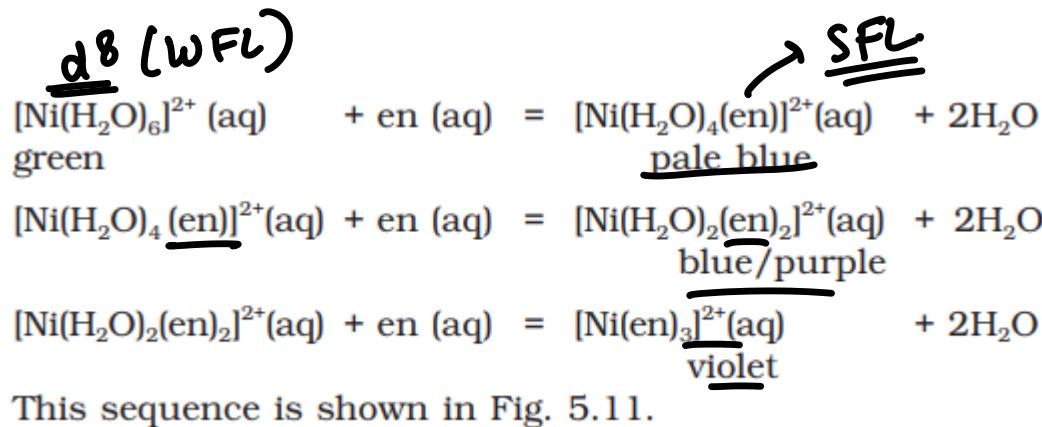


Fig.5.11 Aqueous solutions of complexes of nickel(II) with an increasing number of ethane-1, 2-diamine ligands



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Q- Correct increasing order for the wavelengths of absorption in the visible region for

the complexes of  $\text{Co}^{3+}$  is



- (a)  $[\text{Co}(\text{en})_3]^{3+}, [\text{Co}(\text{NH}_3)_6]^{3+}, [\text{Co}(\text{H}_2\text{O})_6]^{3+}$
- (b)  $[\text{Co}(\text{H}_2\text{O})_6]^{3+}, [\text{Co}(\text{en})_3]^{3+}, [\text{Co}(\text{NH}_3)_6]^{3+}$
- (c)  $[\text{Co}(\text{H}_2\text{O})_6]^{3+}, [\text{Co}(\text{NH}_3)_6]^{3+}, [\text{Co}(\text{en})_3]^{3+}$
- (d)  $[\text{Co}(\text{NH}_3)_6]^{3+}, [\text{Co}(\text{en})_3]^{3+}, [\text{Co}(\text{H}_2\text{O})_6]^{3+}$



(NEET 2017)

$$\underline{CFSE \propto \Delta_o \propto SFL}$$

$$SFL \rightarrow \epsilon \propto \tau (1 \downarrow)$$

Iron carbonyl,  $\text{Fe}(\text{CO}_5)$  is

TBP.

**(NEET 2018)**

(a) trinuclear

**(b) mononuclear**

(c) tetranuclear

(d) dinuclear



~~Q12~~

An example of sigma bonded organometallic compound is

(NEET 2017)



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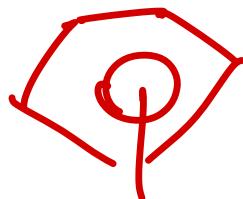
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(a) ruthenocene  $\times$

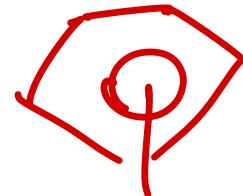
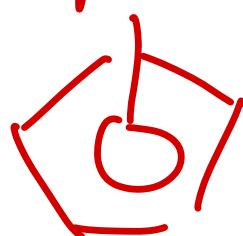
(b) Grignard's reagent

(c) ferrocene  $\times$

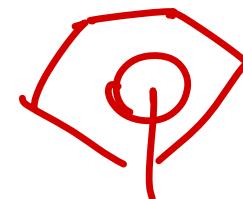
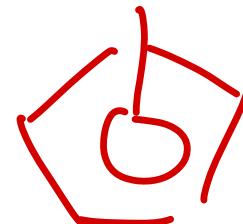
(d) cobaltocene  $\times$



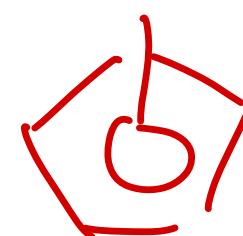
Ru



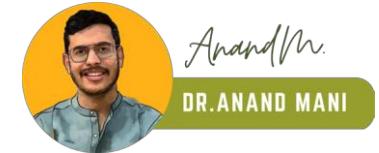
Fe



Co.



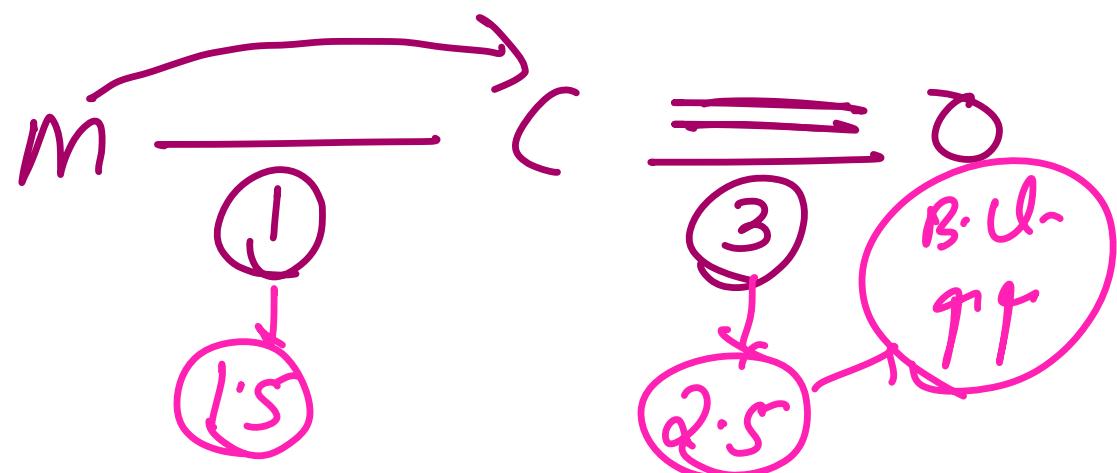
Which of the following has longest C–O bond length? (Free C–O bond length in CO is 1.128Å.)



(NEET-I 2016)

- (a)  $[\text{CO}(\text{CO})_4]^-$
- (b)  $[\text{Fe}(\text{CO})_4]^{2-}$
- (c)  $[\text{Mn}(\text{CO})_6]^+$
- (d)  $\text{Ni}(\text{CO})_4$

\* more is the -ve charge on the complex  
↓  
Backbonding



Which of the following complexes is used to be as an anticancer agent?

(AIPMT 2014)

- (a) *mer*-[Co(NH<sub>3</sub>)<sub>3</sub>Cl<sub>3</sub>]
- (b) *cis*-[PtCl<sub>2</sub>(NH<sub>3</sub>)<sub>2</sub>]
- (c) *cis*-K<sub>2</sub>[PtCl<sub>2</sub>Br<sub>2</sub>]
- (d) Na<sub>2</sub>CoCl<sub>4</sub>

*cis*-<sup>o</sup>Platin.



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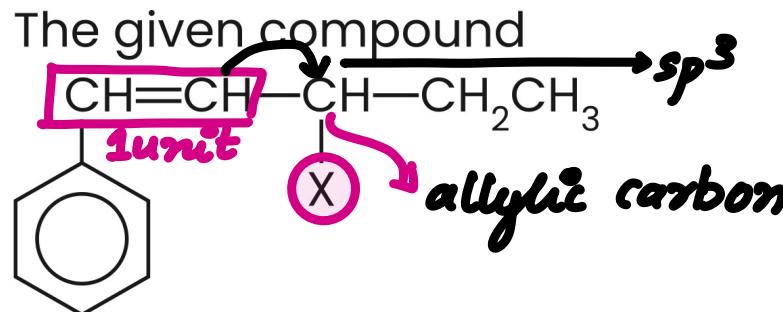
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## HALOALKANES AND HALOARENES

↳ Aromatic compounds  
(Benzene)





is an example of .....

- (a) Allylic halide      (b) Vinylic halide  
(c) Benzylic halide      (d) Aryl halide

(NEET 2023)

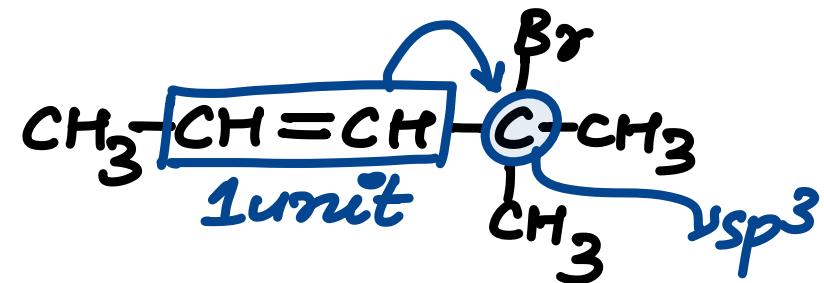
The position of  $-\text{Br}$  in the compound  $\text{CH}_3\text{CH}=\text{CHC}(\text{Br})(\text{CH}_3)_2$ , can be classified as.



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## (NCERT Exemplar)



allylic

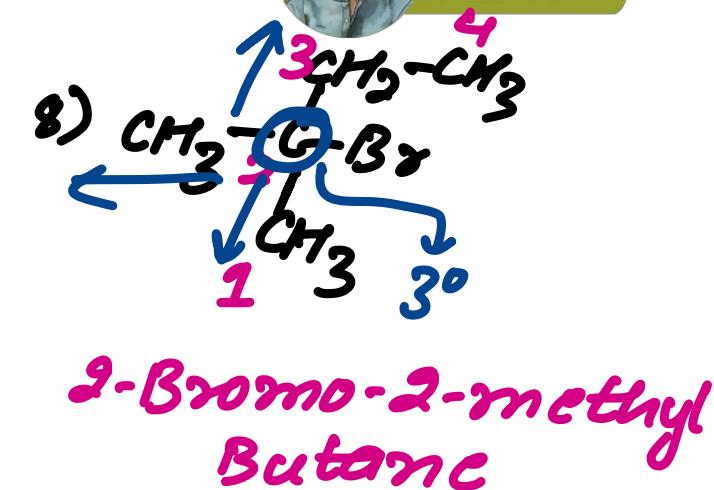
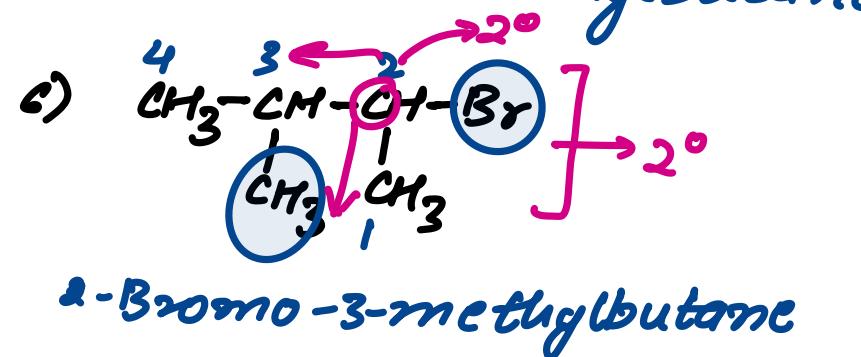
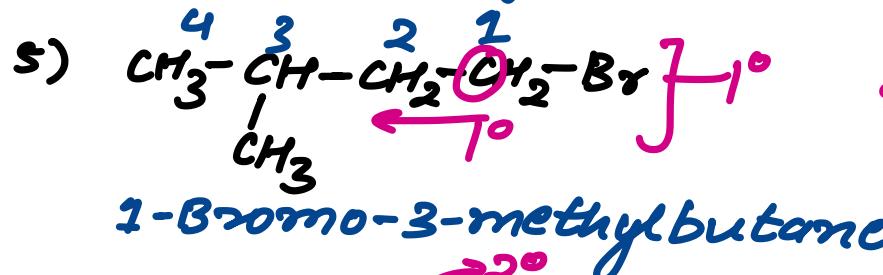
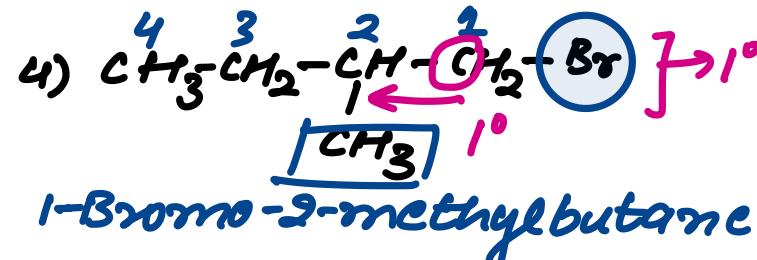
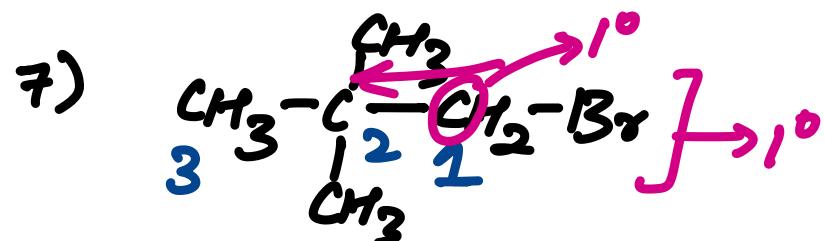
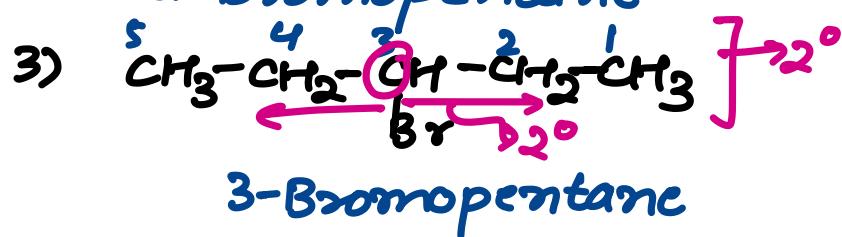
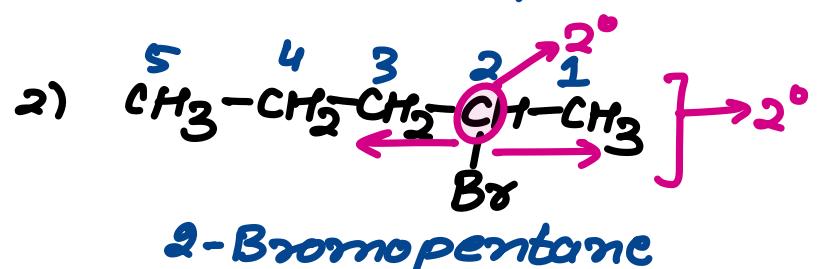
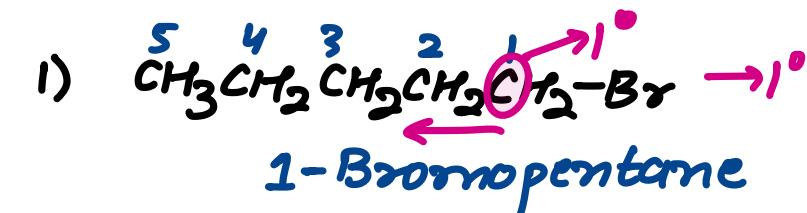
## Example 6.1

Draw the structures of all the eight structural isomers that have the molecular formula  $C_5H_{11}Br$ . Name each isomer according to IUPAC system and classify them as primary, secondary or tertiary bromide.



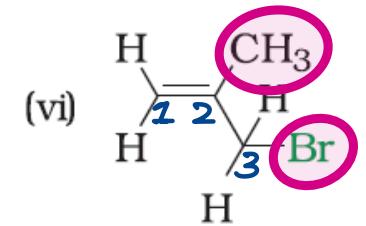
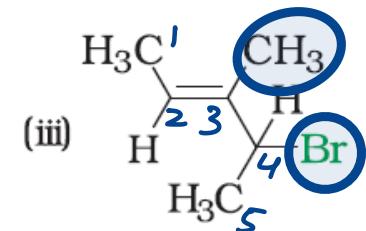
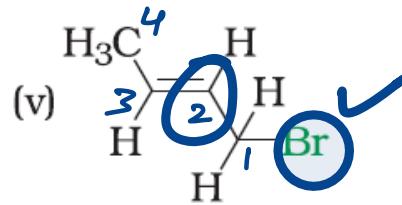
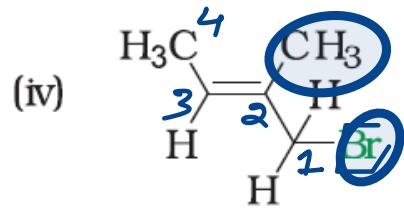
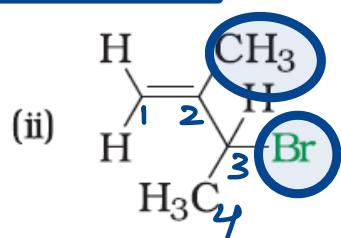
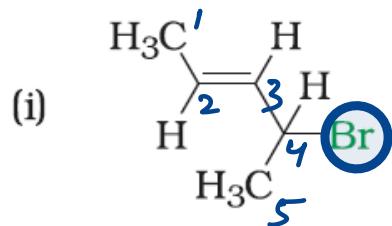
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## Example 6.2

Write IUPAC names of the following:



$f \cdot g \geq, \equiv \geq \text{sub.}$   
 $x \leq$

ii) 4-Bromopent-2-ene

iii) 3-Bromo-2-methylbut-1-ene  
(BEST)  
butene (OK)

iv) 4-Bromo-3-methylpent-2-ene

iv) 1-Bromo-2-methylbut-2-ene

v) 1-Bromobut-2-ene

vi) 3-Bromo-2-methylprop-1-ene



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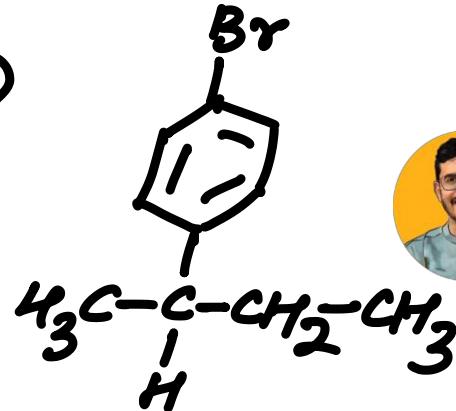
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Intext Question

6.1 Write structures of the following compounds:

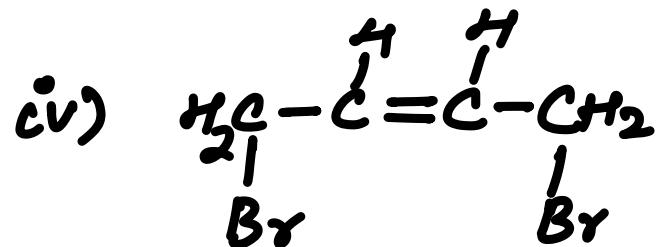
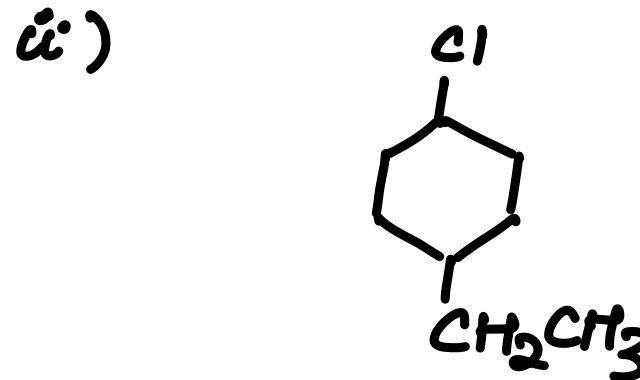
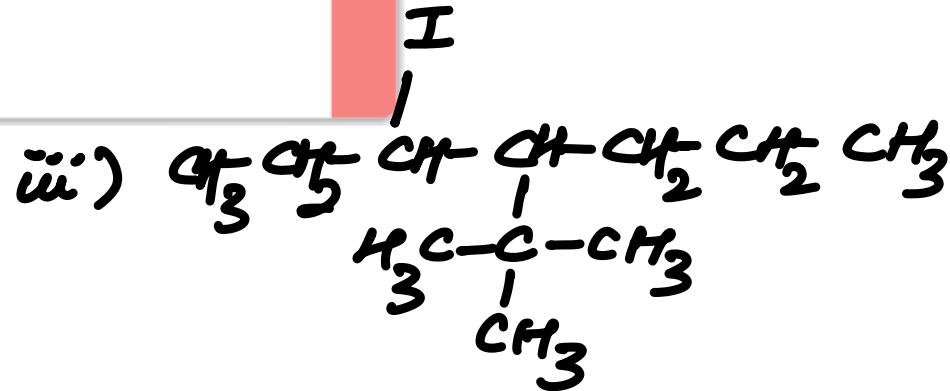
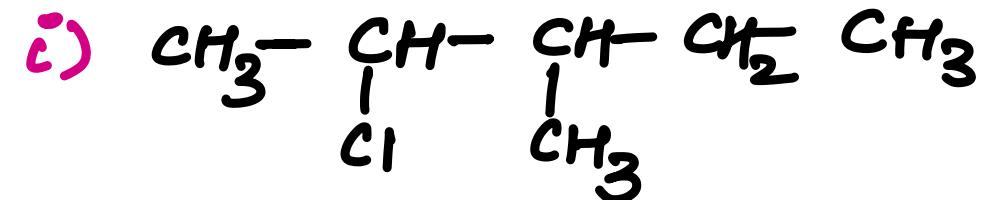
- (i) 2-Chloro-3-methylpentane
- (ii) 1-Chloro-4-ethylecyclohexane
- (iii) 4-tert. Butyl 3-iodoheptane
- (iv) 1,4-Dibromobut-2-ene
- (v) 1-Bromo-4-sec. butyl-2-methylbenzene.

v)



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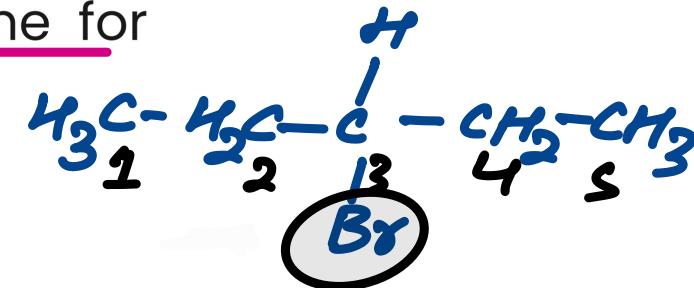
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What should be the correct IUPAC name for diethylbromomethane?

- (a) 1-Bromo-1,1-diethylmethane
- (b) ~~3-Bromopentane~~
- (c) 1-Bromo-1-ethylpropane
- (d) 1-Bromopentane

(NCERT Exemplar)



3-Bromopentane



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### Example 6.3

→ (4)

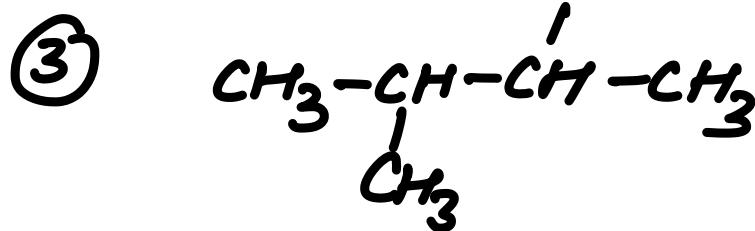
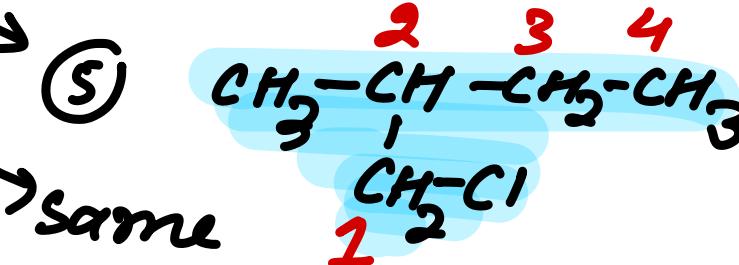
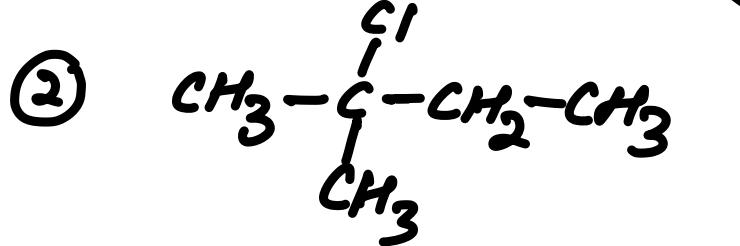
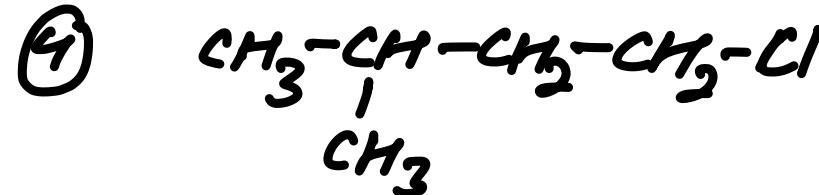
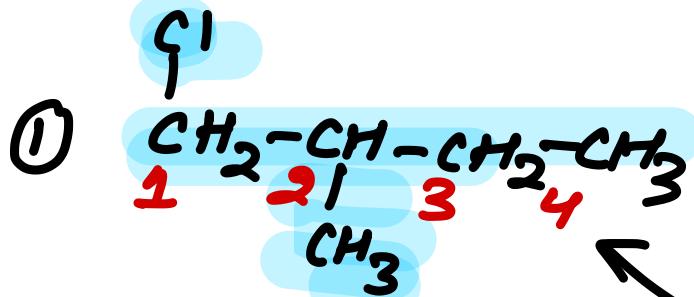
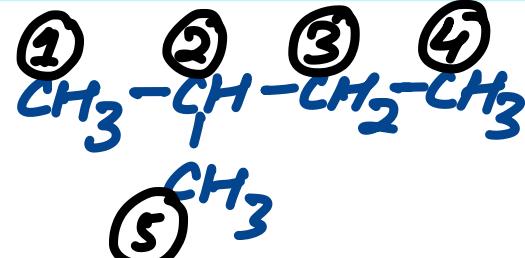
IUPAC → diff.

Identify all the possible monochloro structural isomers expected to be formed on free radical monochlorination of  $(CH_3)_2CHCH_2CH_3$ .



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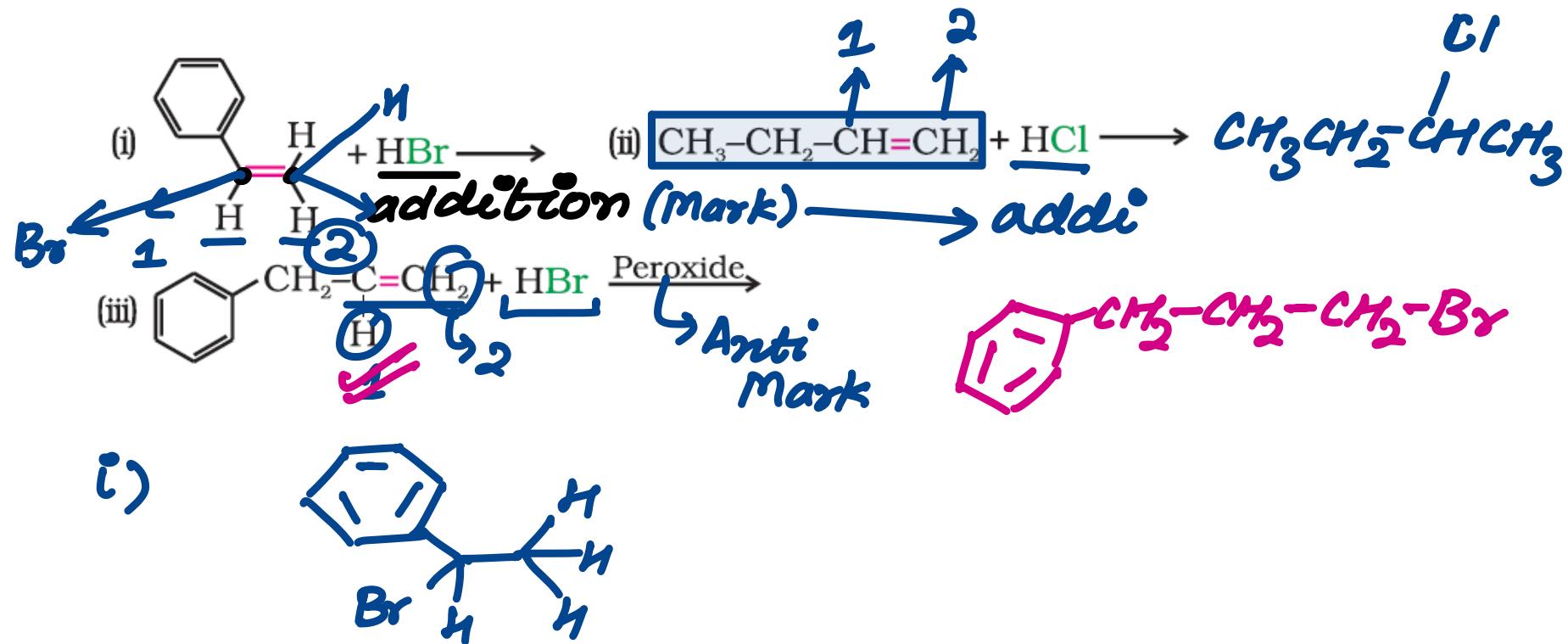
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same

### Example 6.4

Write the products of the following reactions:



### Intext Questions



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6.2 Why is sulphuric acid not used during the reaction of alcohols with KI?



$\times$   $\frac{H_2SO_4}{\text{good DA}} \longrightarrow$  it will oxidise KI to  $I_2$ .

$$KI + H_2SO_4 \longrightarrow I_2 \quad \times$$

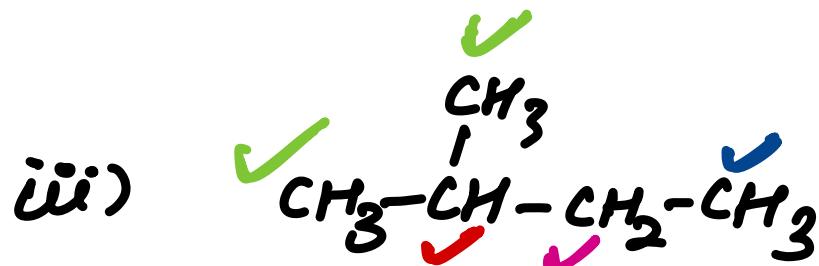
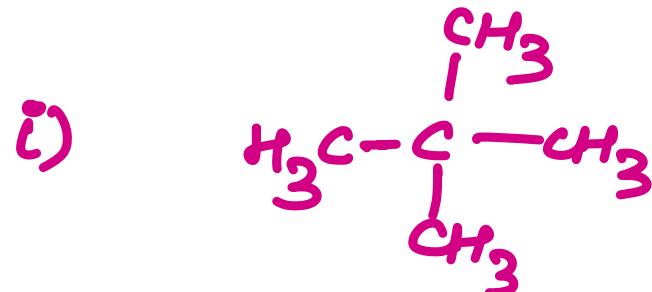
6.3 Write structures of different dihalogen derivatives of propane.

- 1)  $\begin{array}{c} \text{Br} \\ | \\ \text{CH}-\text{CH}_2-\text{CH}_3 \\ | \\ \text{Br} \end{array}$
- 2)  $\begin{array}{c} \text{Br} \\ | \\ \text{CH}_3-\text{C}-\text{CH}_3 \\ | \\ \text{Br} \end{array}$
- 3)  $\begin{array}{c} -2\text{H} \\ +2\text{Br} \\ \text{CH}_3-\text{CH}_2-\text{CH}_3 \end{array}$
- 4)  $\begin{array}{c} \text{CH}_2-\text{CH}_2-\text{CH}_2 \\ | \\ \text{Br} \end{array}$

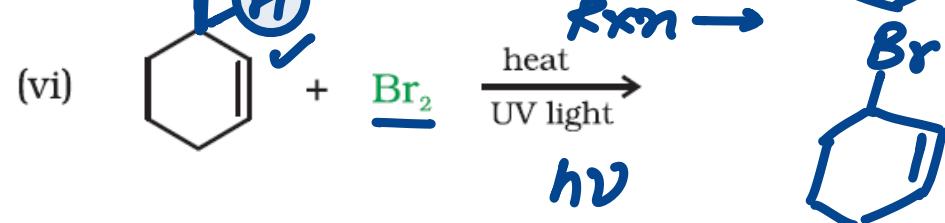
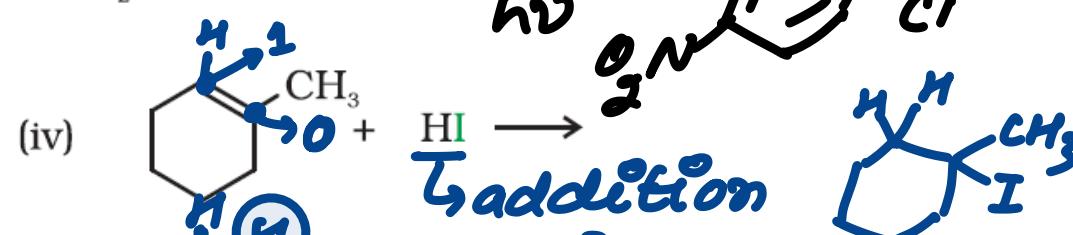
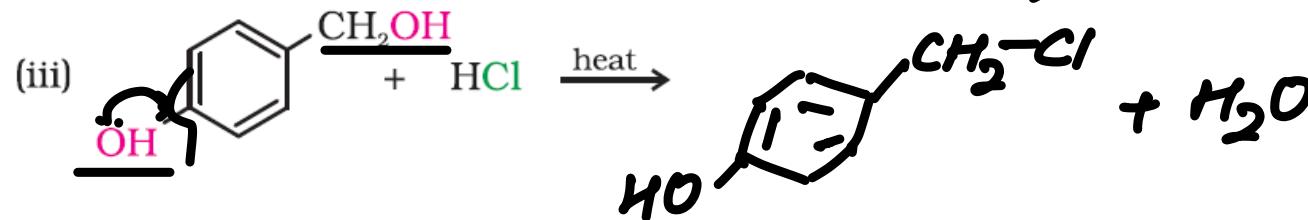
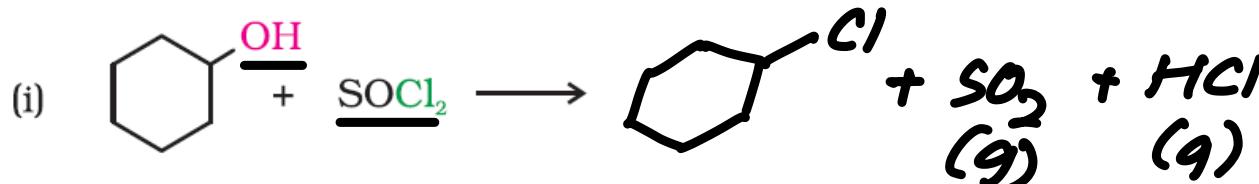
6.4 Among the isomeric alkanes of molecular formula  $C_5H_{12}$ , identify the one that on photochemical chlorination yields

- (i) A single monochloride.
- (ii) Three isomeric monochlorides.
- (iii) Four isomeric monochlorides.

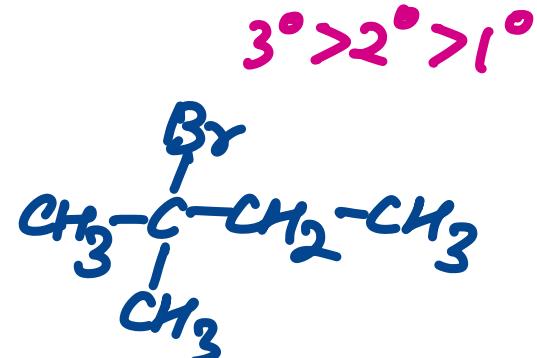
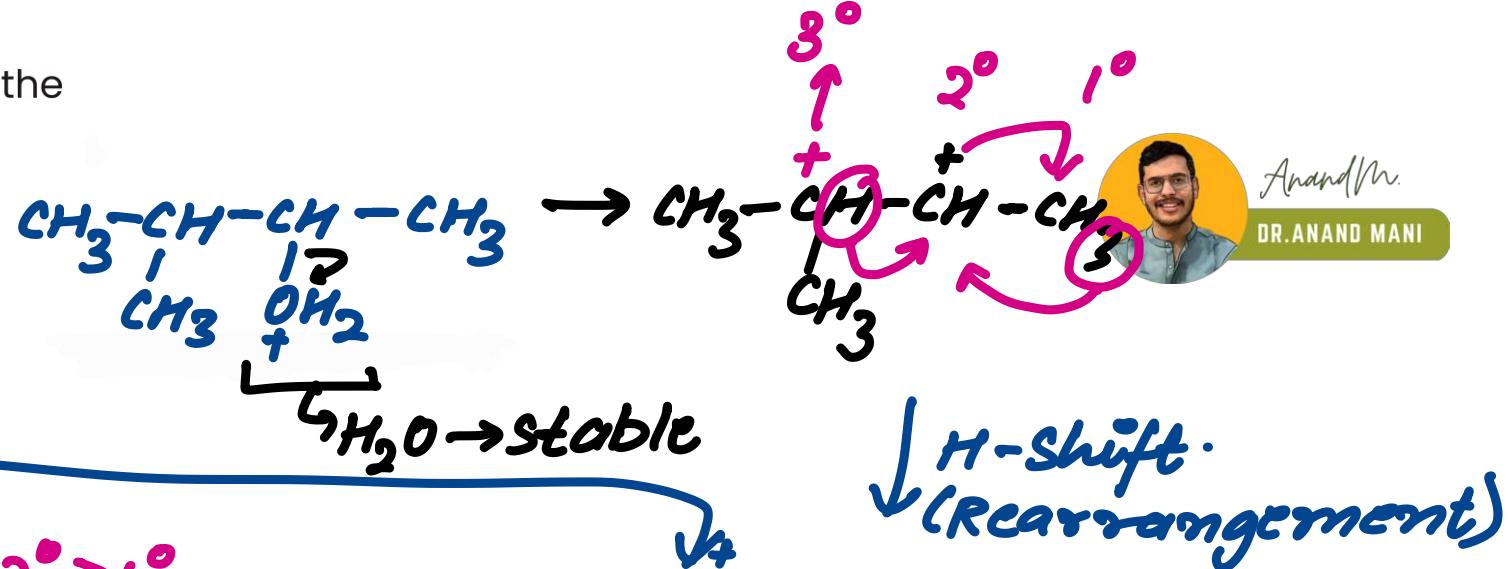
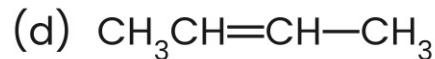
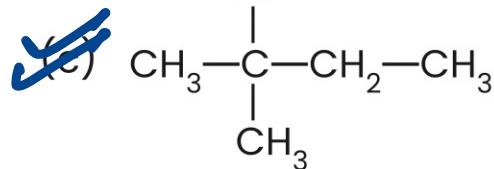
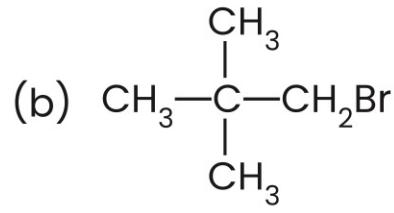
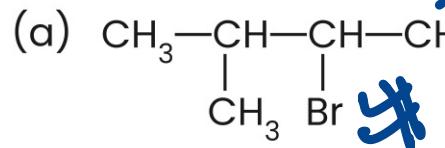
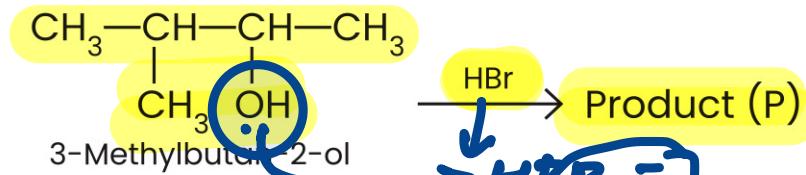
$\text{h}\nu/\text{Cl}_2 \rightarrow \text{subs}$



6.5 Draw the structures of major monohalo products in each of the following reactions:

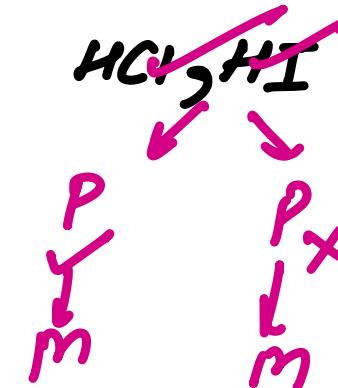
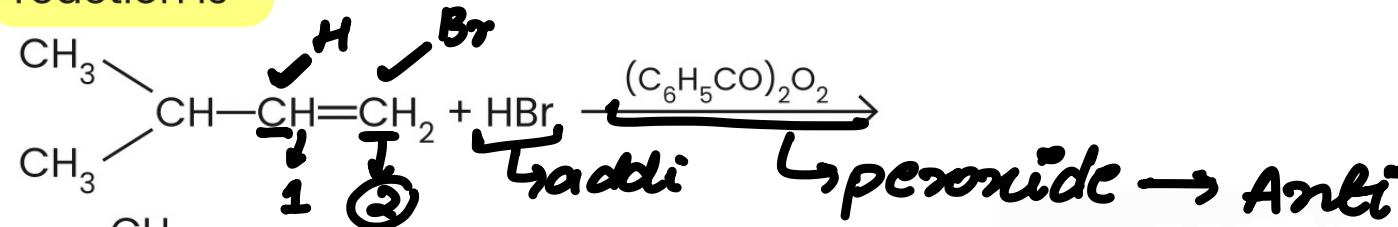


Consider the following reaction and identify the product (P).

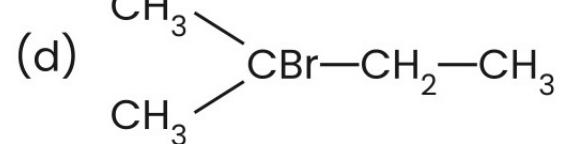
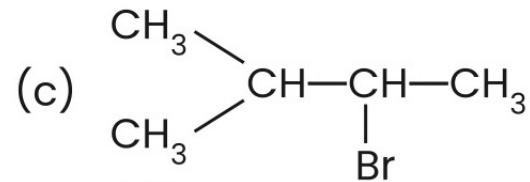
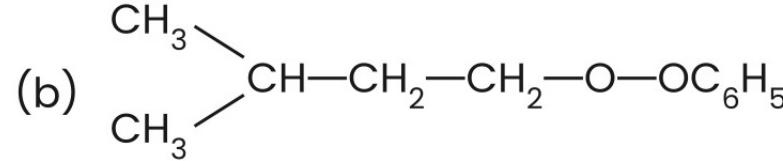
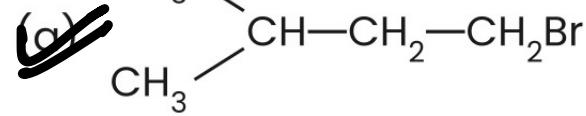


(NEET 2023)

The major product of the following chemical reaction is



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## Intext Question

6.6 Arrange each set of compounds in order of increasing boiling points.

(i) Bromomethane, Bromoform, Chloromethane, Dibromomethane.

(ii) 1-Chloropropane, Isopropyl chloride, 1-Chlorobutane.

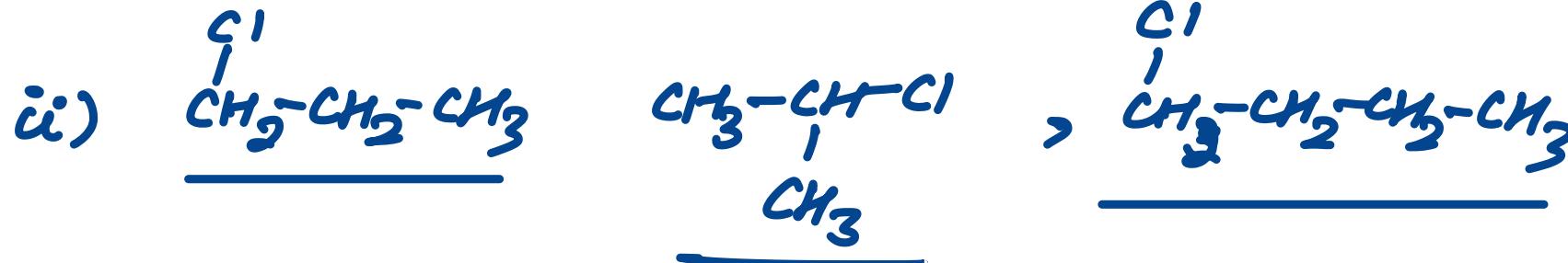


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i)



### Example 6.5

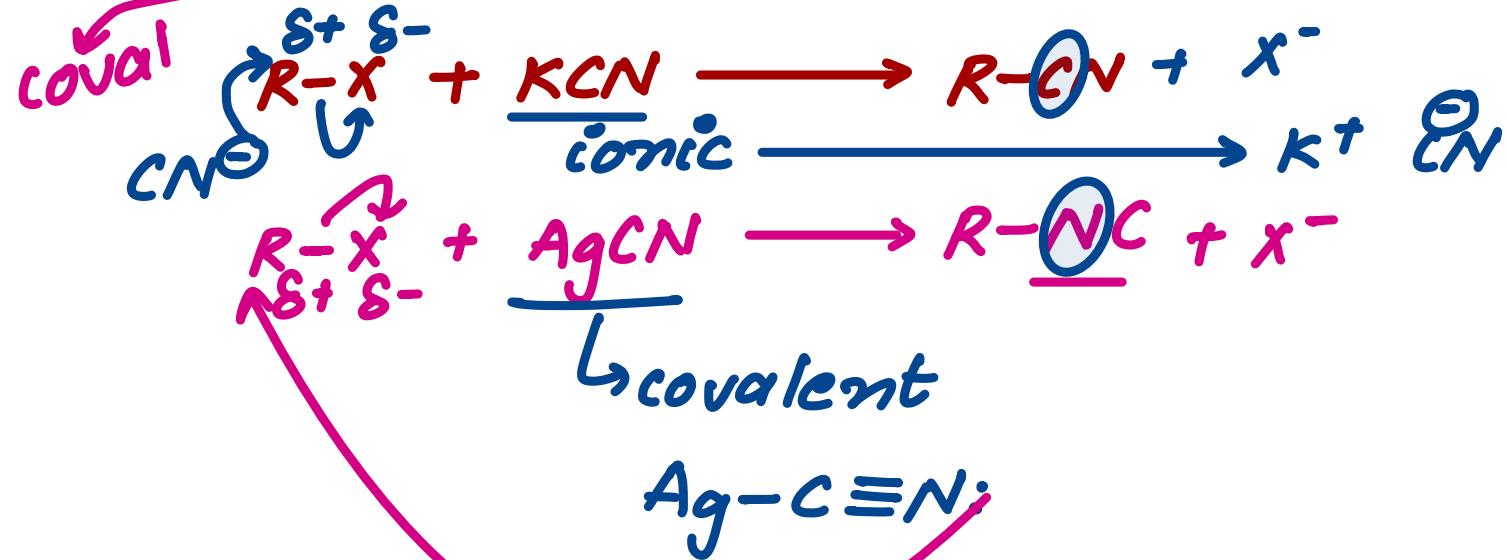
ionic

Haloalkanes react with KCN to form alkyl cyanides as main product while AgCN forms isocyanides as the chief product. Explain.



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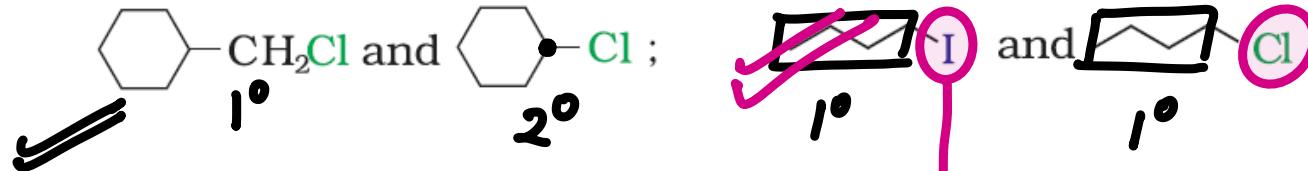
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## Example 6.6

In the following pairs of halogen compounds, which would undergo  $S_N2$  reaction faster?

$\xrightarrow{S_N2}$  **steric hindrance**







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### Example 6.7

Predict the order of reactivity of the following compounds in  $S_N1$  and  $S_N2$  reactions:

(i) The four isomeric bromobutanes

(ii)  $C_6H_5CH_2Br$ ,  $C_6H_5CH(C_6H_5)Br$ ,  $C_6H_5CH_2CH_3Br$ ,  $C_6H_5C(CH_3)(C_6H_5)Br$

$3^\circ > 2^\circ > 1^\circ \rightarrow S_N1$

$1^\circ > 2^\circ > 3^\circ$

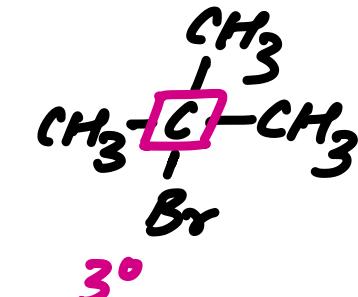
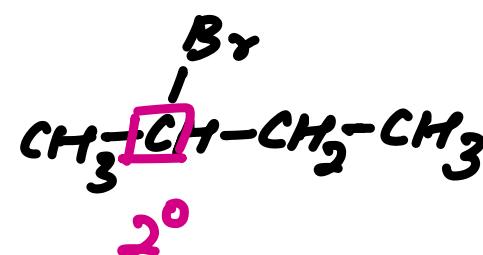
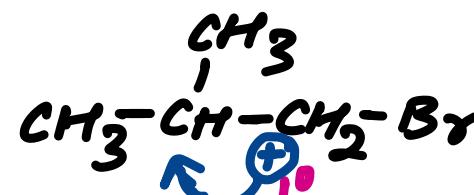
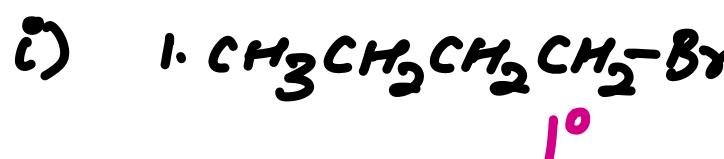
$\hookrightarrow S_N2$



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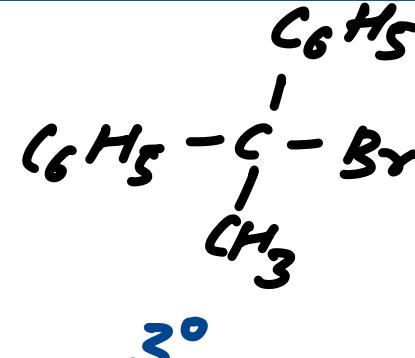
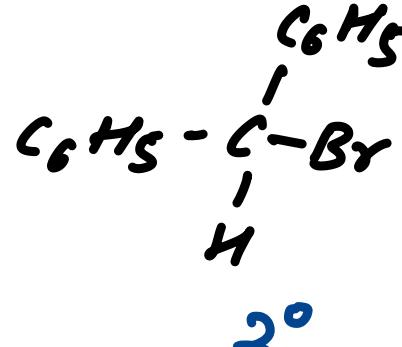
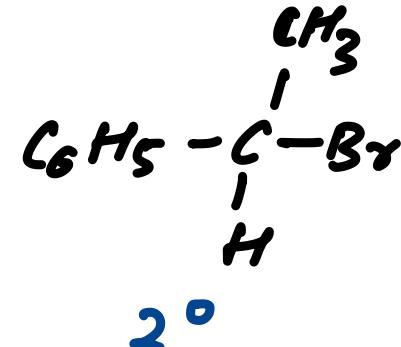
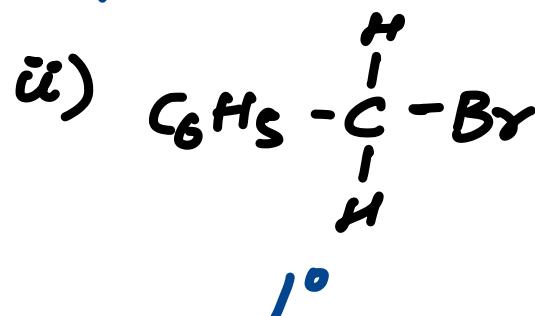
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$S_N2$



$S_N1$

$S_N2$   $\leftarrow$

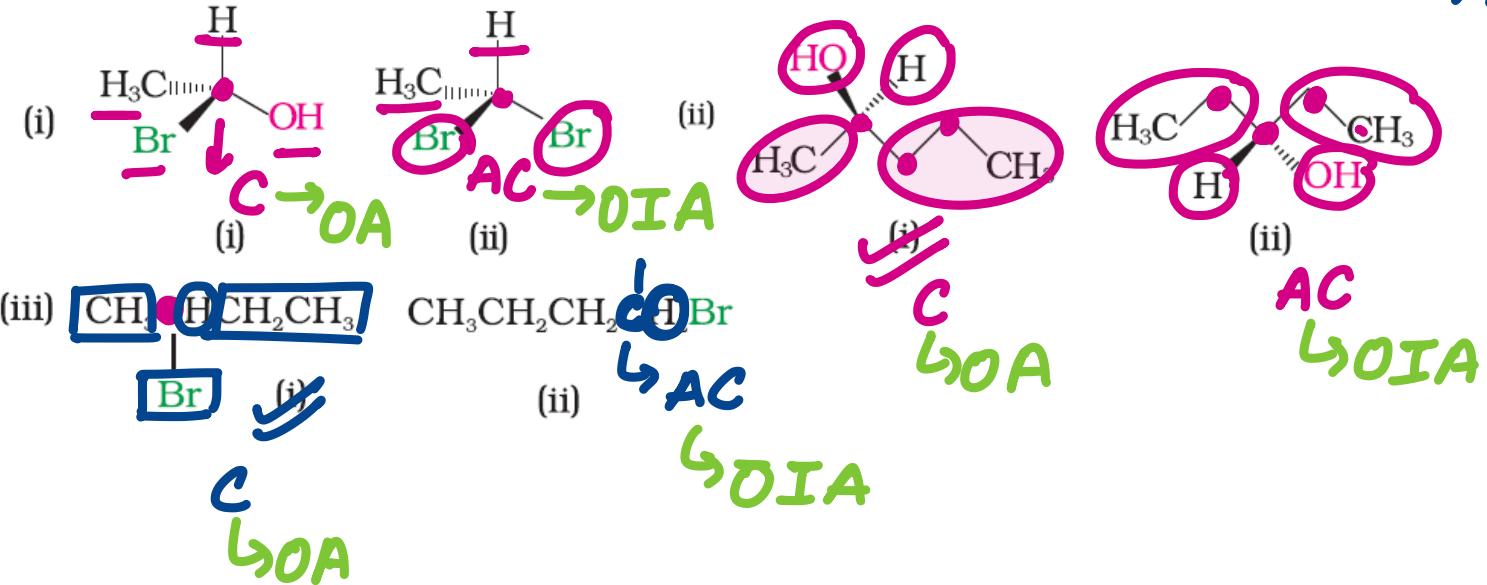


$S_N1$

Ass C → 4 diff. group.

Example 6.8

Identify chiral and achiral molecules in each of the following pair of compounds. (Wedge and Dash representations according to Class XI.)



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The incorrect statement regarding chirality is

(✓) Enantiomers are superimposable mirror images on each other.

(b) A racemic mixture shows zero optical rotation.

*Inversion + retention*

(c)  $S_N1$  reaction yields 1 : 1 mixture of both enantiomers.

(d) The product obtained by  $S_N2$  reaction of haloalkane having chirality at the reactive site shows inversion of configuration.

*(NEET 2022)*

Enantiomers

A/B

non-om



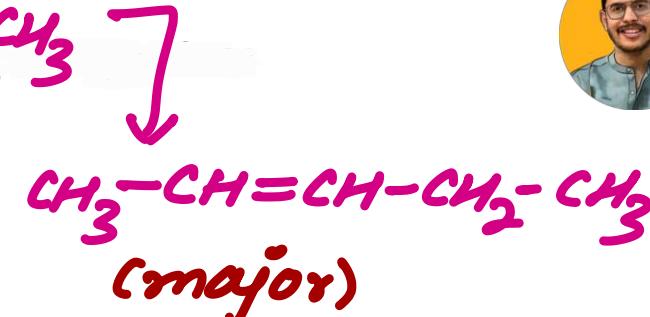
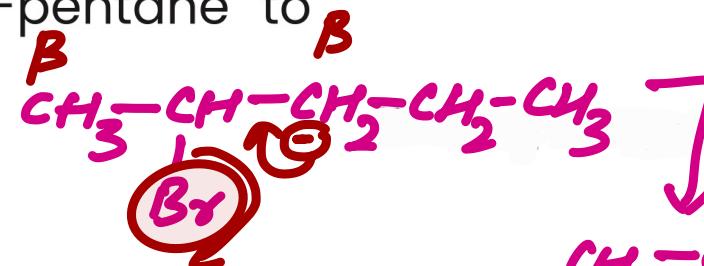
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Elimination reaction of 2-bromo-pentane to form pent-2-ene is

- (1)  $\beta$ -elimination reaction ✓
  - (2) Follows Zaitsev rule. ✓
  - (3) Dehydrohalogenation reaction ✓
  - (4) Dehydration reaction X
- (a) (1), (3), (4)      (b) (2), (3), (4)  
(c) (1), (2), (4)      ~~(d)~~ (1), (2), (3)

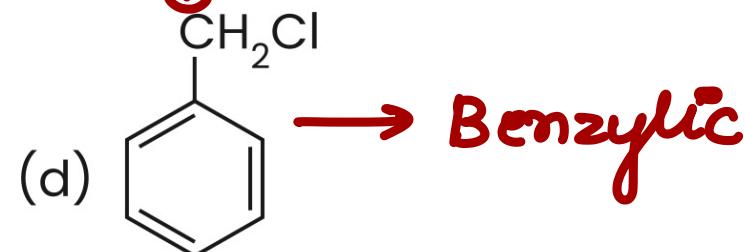
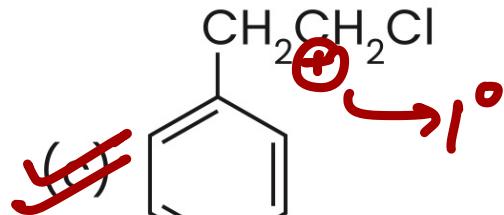
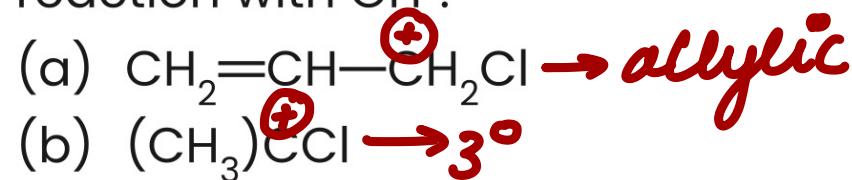
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Which of the following will not undergo reaction with  $\text{OH}^-$ ?



$\xrightarrow{\text{S}_{\text{N}}1}$   $\xrightarrow{\text{CC}^+}$  **Allylic/Benzyllic**  
 $3^\circ > 2^\circ > 1^\circ$



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Can you think why does  $\text{NO}_2$  group show its effect only at *ortho*- and *para*- positions and not at *meta*- position?

↓  
no negative charge  
↓  
EWG  
↳ no effect.

↓  
-ve  $\rightarrow$  *ortho/para*  
+  
EWG  $\rightarrow$   $\text{NO}_2$



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## Example 6.9

Although chlorine is an electron withdrawing group, yet it is ortho-, para- directing in electrophilic aromatic substitution reactions. Why?

$-I \rightarrow \text{withdraw}$

$\downarrow$   
*Reactivity  
and  
stability.*

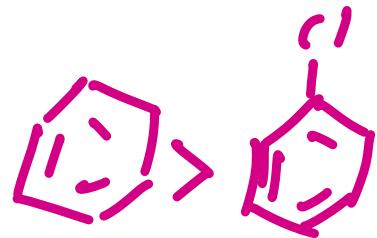
$+M \rightarrow \text{donates}$

$\downarrow$   
*orientation*



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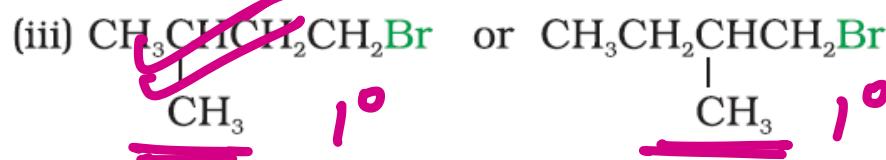
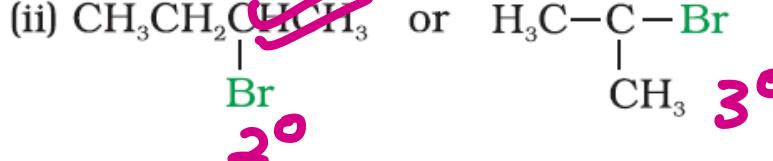
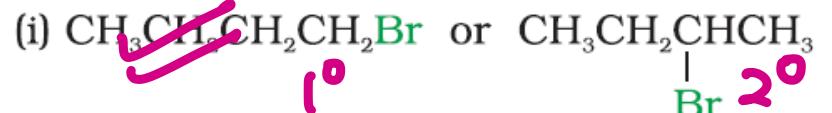
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$1^\circ > 2^\circ > 3^\circ$

Intext Questions

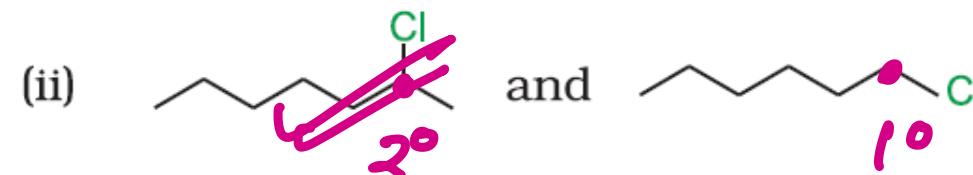
- 6.7 Which alkyl halide from the following pairs would you expect to react more rapidly by an  $S_N2$  mechanism? Explain your answer.



less  
hundred.

6.8 In the following pairs of halogen compounds, which compound undergoes faster  $S_N1$  reaction?

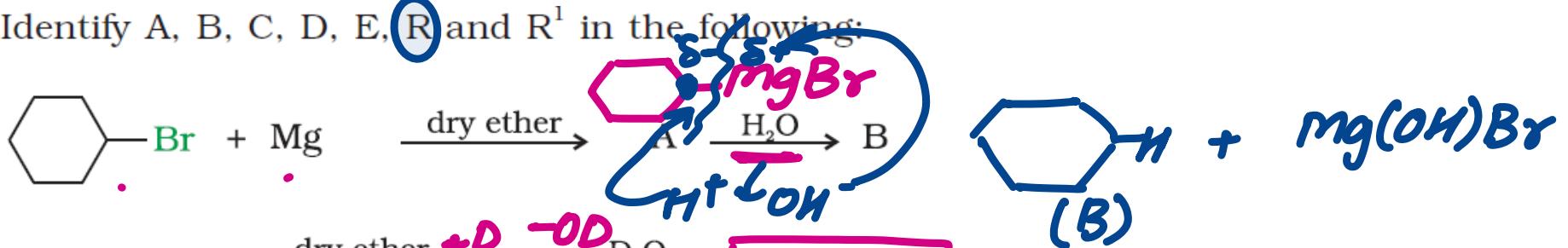
$\text{S}_{\text{N}}^1$  reaction?  
 $\xrightarrow{\text{Cl}} 3^\circ > 2^\circ > 1^\circ$



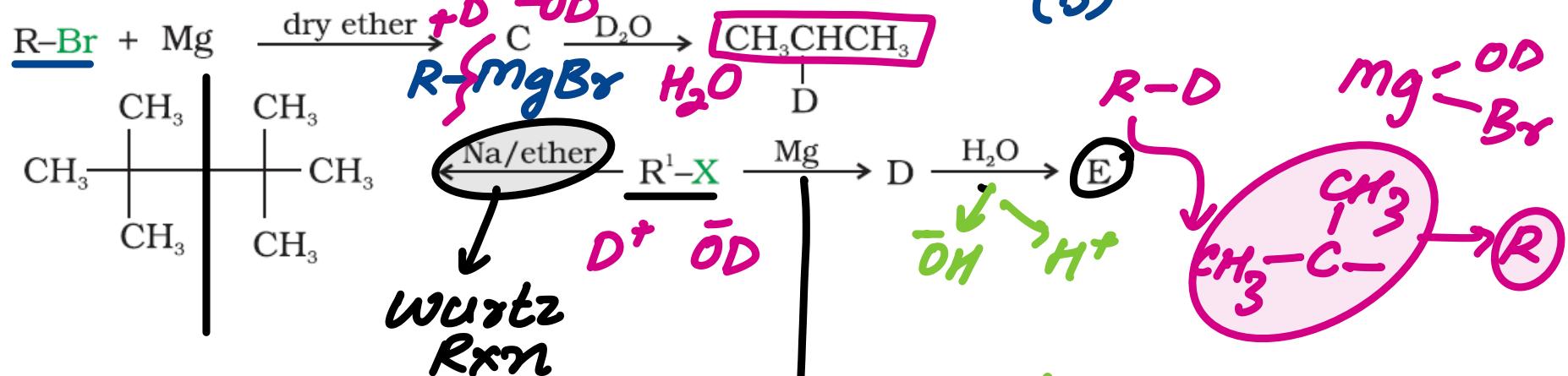
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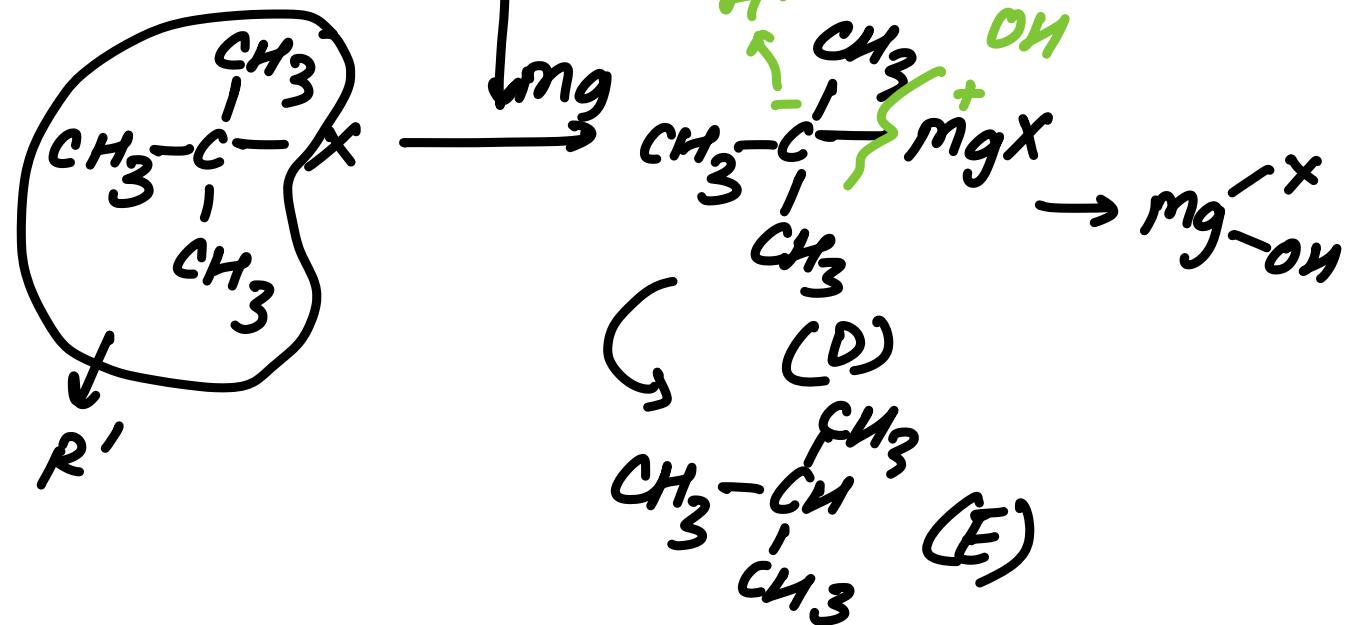
6.9 Identify A, B, C, D, E, R and R' in the following:

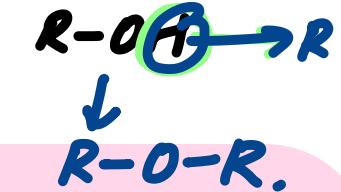
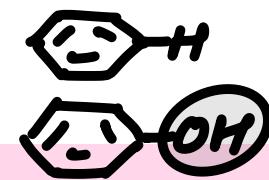
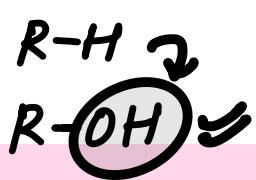


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$R' \rightarrow$





# Alcohols, Phenols and Ethers



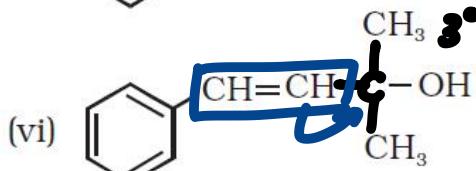
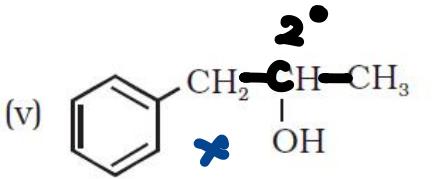
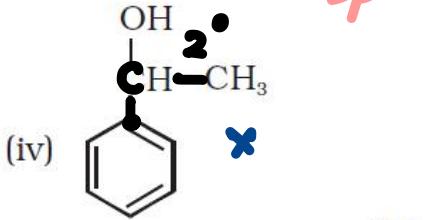
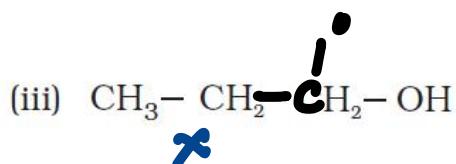
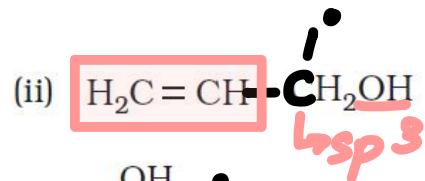
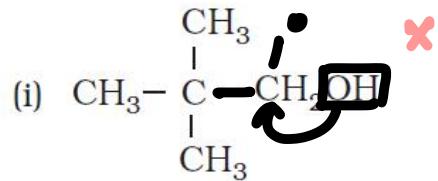
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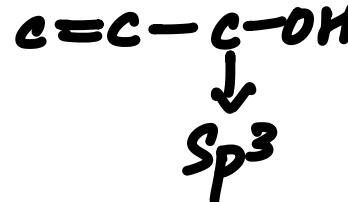


### Intext Questions

7.1 Classify the following as primary, secondary and tertiary alcohols:



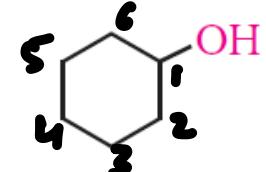
7.2 Identify allylic alcohols in the above examples.



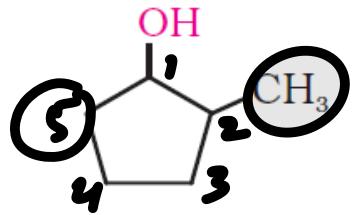
ii), vi)

# 1° prefix.

Cyclic alcohols are named using the prefix cyclo and considering the —OH group attached to C-1.



Cyclohexanol



2-Methylcyclopentanol

2° prefix + 1° prefix + word + 1° suffix + 2° suffix  
Root an -1-01 ✓ (BEST)

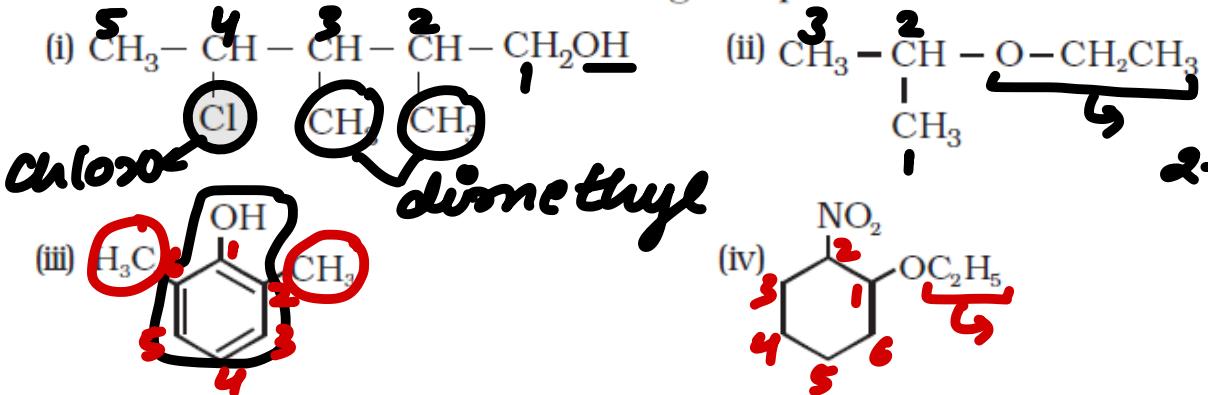


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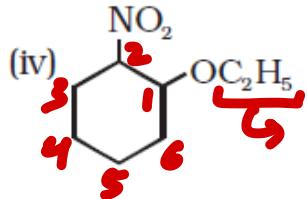
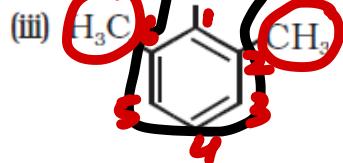
Example 7.1

Give IUPAC names of the following compounds:



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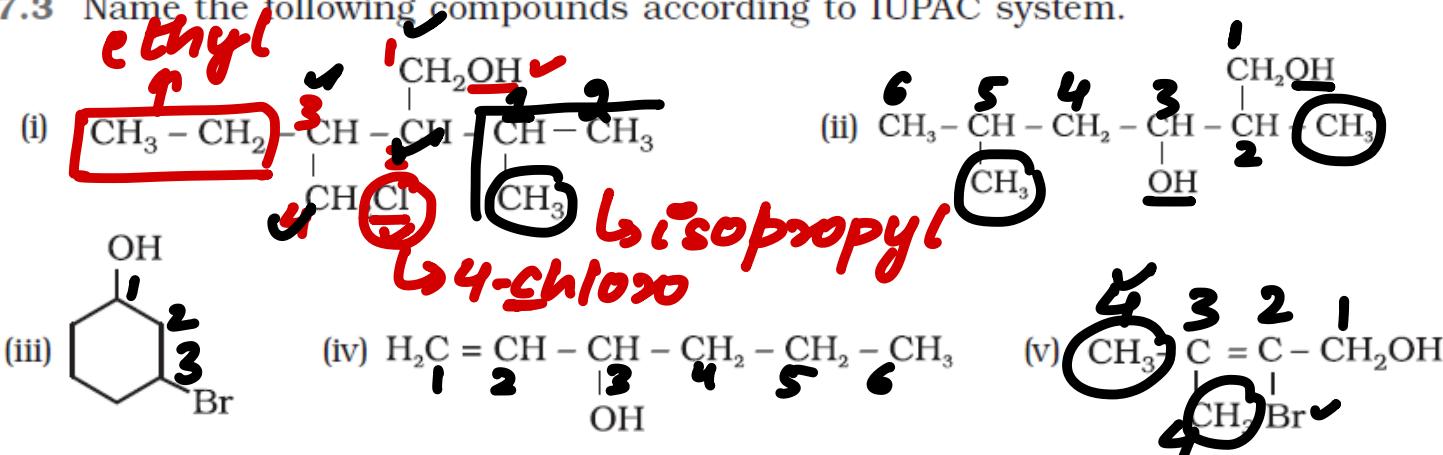
(i) 4-chloro-2,3-dimethylpentan-1-ol ✓ (BEST)  
pentanol ✓ (OK)

iii) 2,6-dimethylphenol

iv) 1-ethoxy-2-nitrocyclohexane

Intext Questionf.g > =, > no. of C

7.3 Name the following compounds according to IUPAC system.



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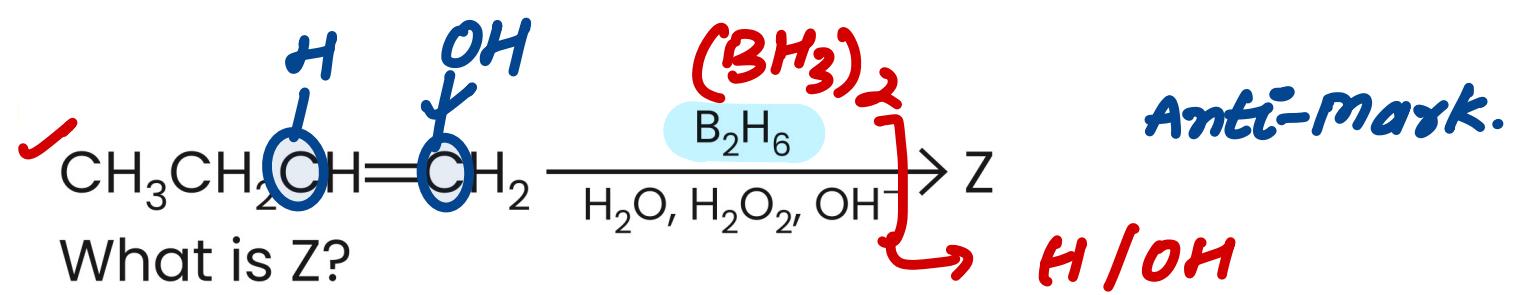
i) *4-chloro-3-ethyl-2-(1-methylpropyl)-butan-1-ol*

ii) *2,5-dimethylhexane-1,3-diol*

iii) *3-bromocyclohexan-1-ol*

iv) *Hex-1-en-3-ol*

v) *2-bromo-3-methylbut-2-en-1-ol*



What is Z?

- ~~(a)~~  $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{OH}$   
 (b)  $\text{CH}_3\text{CH}_2\text{CHCH}_3$   
     |  
     OH  
 (c)  $\text{CH}_3\text{CH}_3\text{CH}_2\text{CHO}$   
 (d)  $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_3$

(NEET 2020)



## Example 7.2

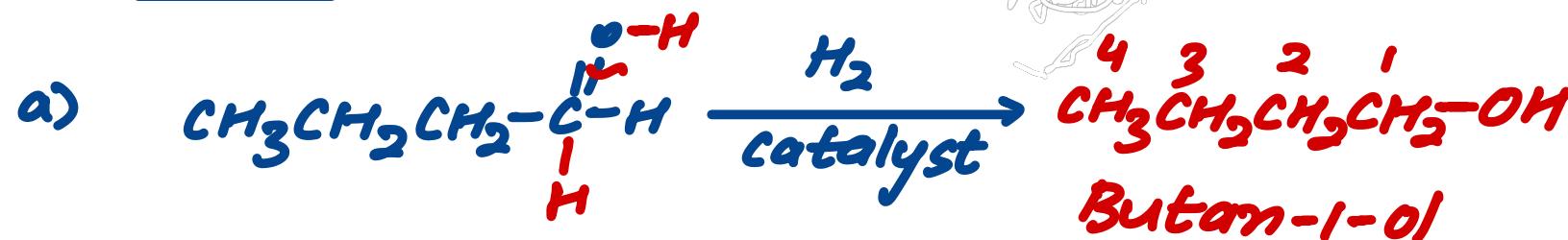
Give the structures and IUPAC names of the products expected from the following reactions:

- Catalytic reduction of butanal.
- Hydration of propene in the presence of dilute sulphuric acid.
- Reaction of propanone with methylmagnesium bromide followed by hydrolysis.

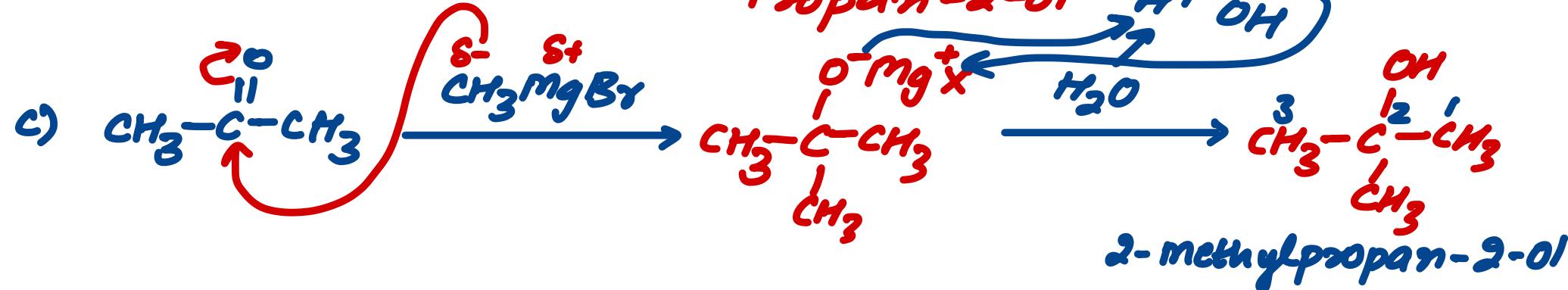


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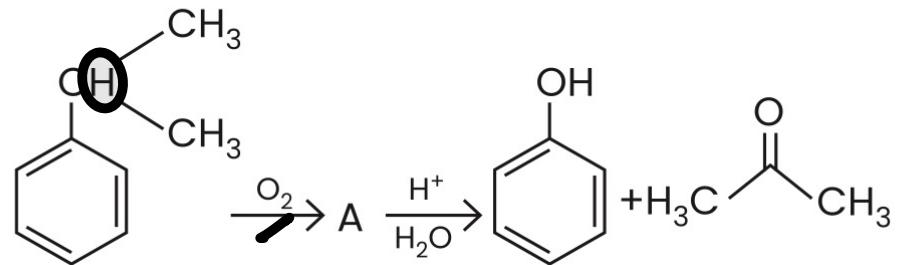
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Propan-2-ol

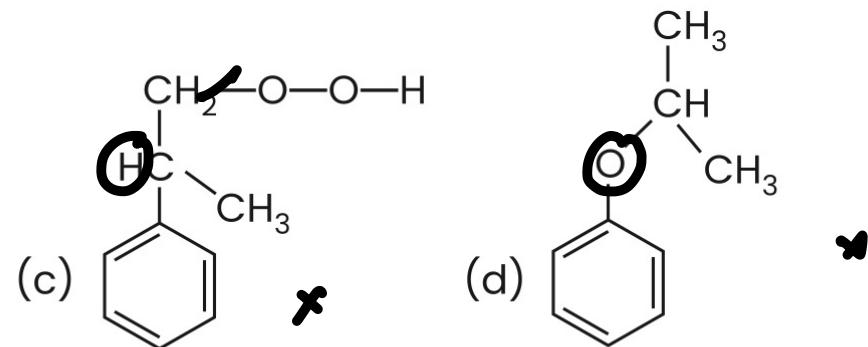
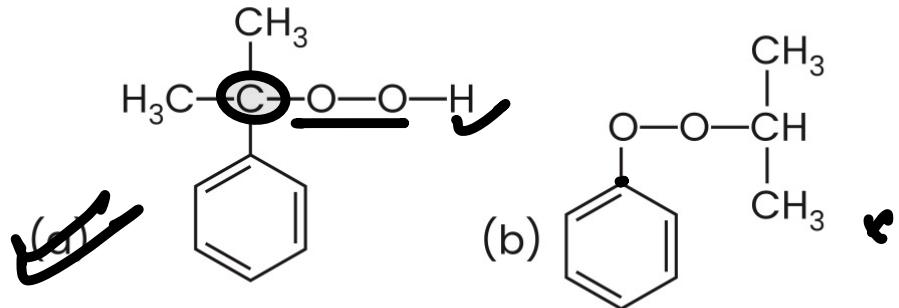
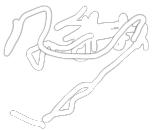


The structure of the intermediate A in the following reaction, is



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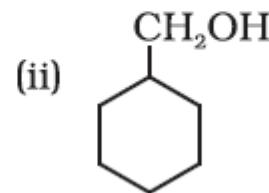
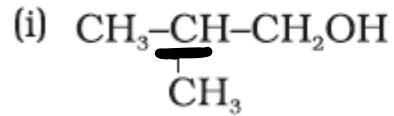
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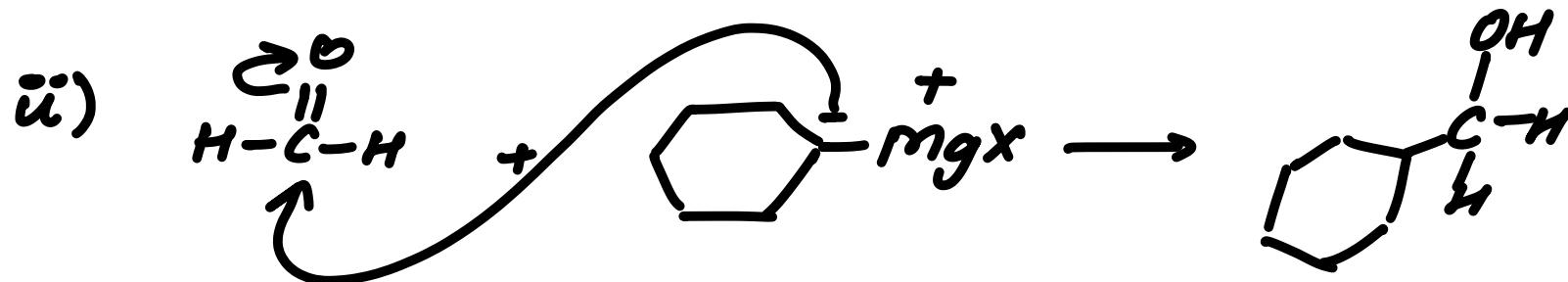
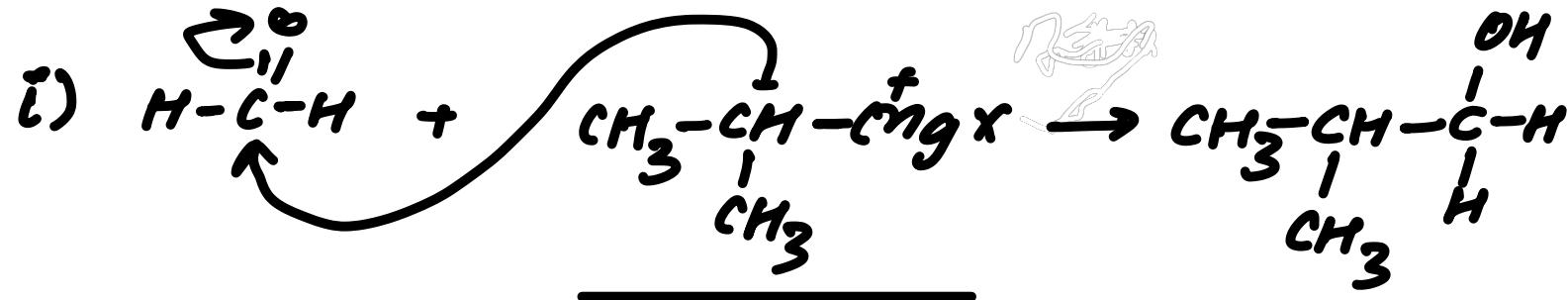
### Intext Questions

7.4 Show how are the following alcohols prepared by the reaction of a suitable Grignard reagent on methanal?

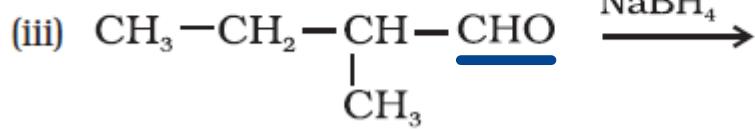
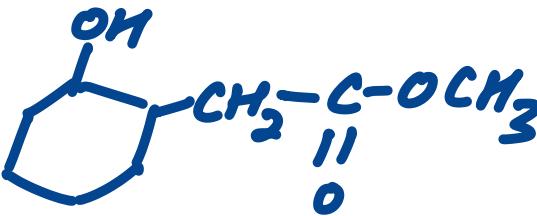
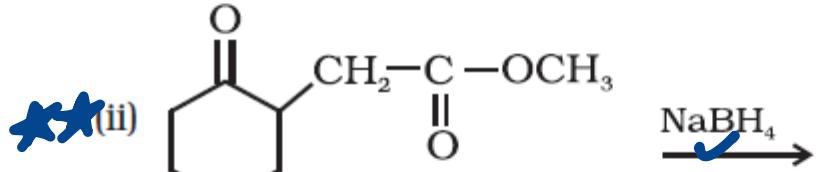


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7.5 Write structures of the products of the following reactions:

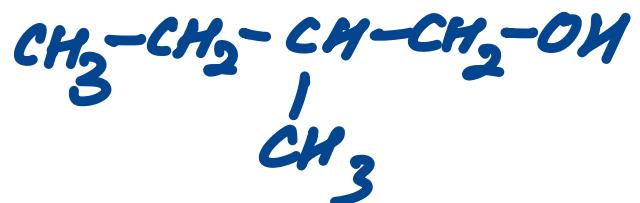


- NaBH<sub>4</sub>  
↓  
[4fg  
Reduce  
 ① Ald  
 ② Keto  
 ③ Acid halide  
 ④ Iminc.



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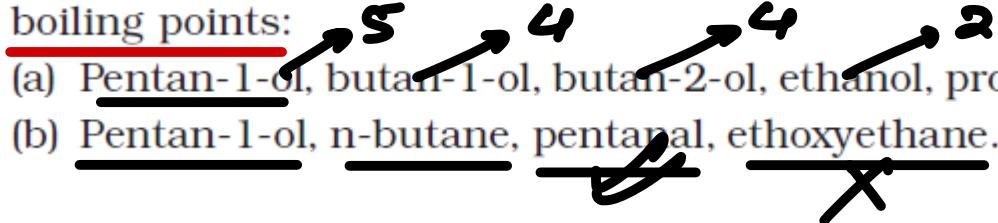
### Example 7.3

Arrange the following sets of compounds in order of their increasing boiling points:

(a) Pentan-1-ol, butan-1-ol, butan-2-ol, ethanol, propan-1-ol, methanol.

(b) Pentan-1-ol, n-butane, pentanal, ethoxyethane.

\*



a)  $\text{Methanol} < \text{Ethanol} < \text{propan-1-ol} < \text{butan-2-ol} < \text{butan-1-ol} < \text{Pentan-1-ol}$

b)  $\text{n-Butane} < \text{ethoxyethane} < \text{pentanal} < \text{Pentan-1-ol}$

1. Higher MM,  
2. Less Branching.



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### Example 7.4

→ EWG.

Arrange the following compounds in increasing order of their acid strength:

Propan-1-ol, 2,4,6-trinitrophenol, 3-nitrophenol, 3,5-dinitrophenol, phenol, 4-methylphenol.

↓ EODG

↓ EODG

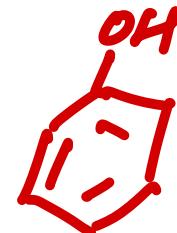
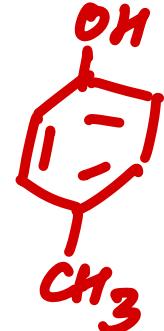
↓



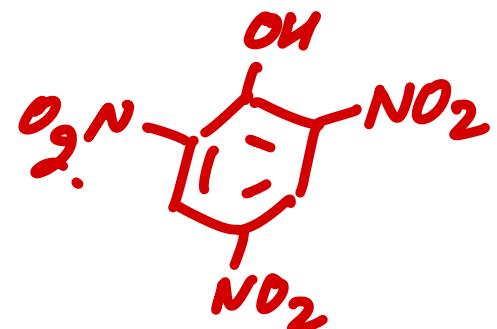
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1. Propan-1-ol < 4-methylphenol < phenol < 3-nitrophenol



< 3,5-dinitrophenol < 2,4,6-trinitrophenol



Given below are two statements

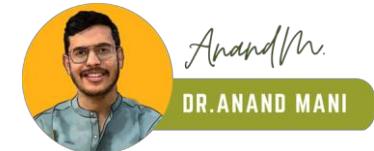
**Statement I :** The acidic strength of monosubstituted nitrophenol is higher than phenol because of electron withdrawing nitro group.

**Statement II :** o-nitrophenol, m-nitrophenol and p-nitrophenol will have same acidic strength as they have one nitro group attached to the phenolic ring.

In the light of the above statements, choose the most appropriate answer from the options given below :

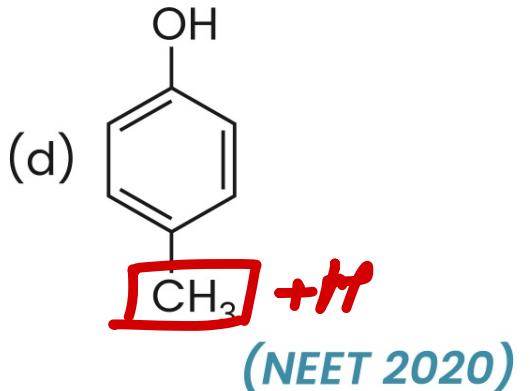
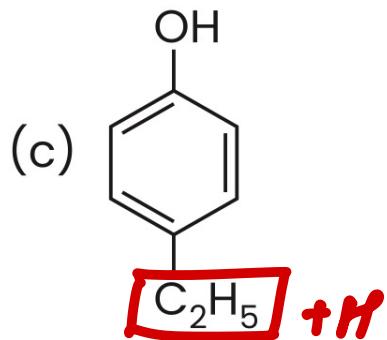
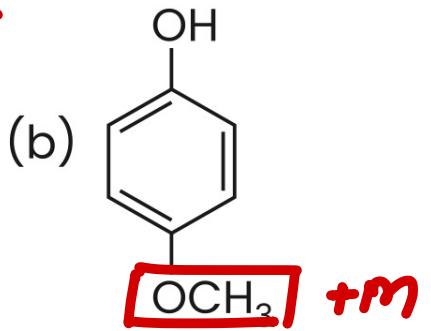
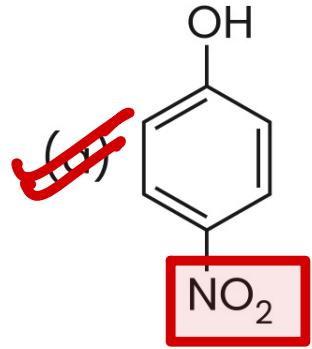
- (a) Statement I is correct but Statement II is incorrect.
- (b) Statement I is incorrect but Statement II is correct.
- (c) Both Statement I and Statement II are correct.
- (d) Both Statement I and Statement II are incorrect.

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Which of the following substituted phenols is the strongest acid?

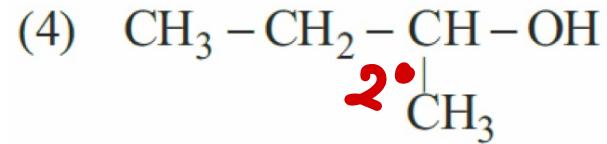
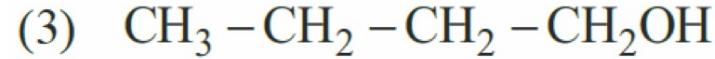
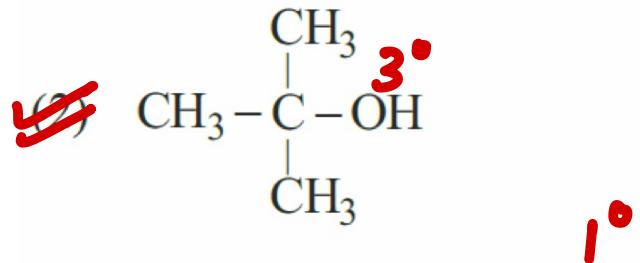
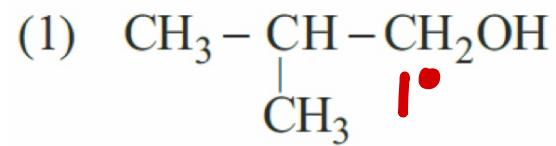
**GEWG.**



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Which one of the following alcohols reacts  
instantaneously with Lucas reagent?



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Given below are two statements :

**Statement I:** In Lucas test, primary, secondary and tertiary alcohols are distinguished on the basis of their reactivity with conc.  $\text{HCl} + \text{ZnCl}_2$ , known as Lucas Reagent.

**Statement II :** Primary alcohols are most reactive and immediately produce turbidity at room temperature on reaction with Lucas Reagent.

In the light of the above statements, choose the most appropriate answer from the options given below :

- (a) Statement I is correct but Statement II is incorrect
- (b) Statement I is incorrect but Statement II is correct
- (c) Both Statement I and Statement II are correct
- (d) Both Statement I and Statement II are incorrect

**(NEET 2022)**



The products A and B obtained in the following reactions, respectively, are



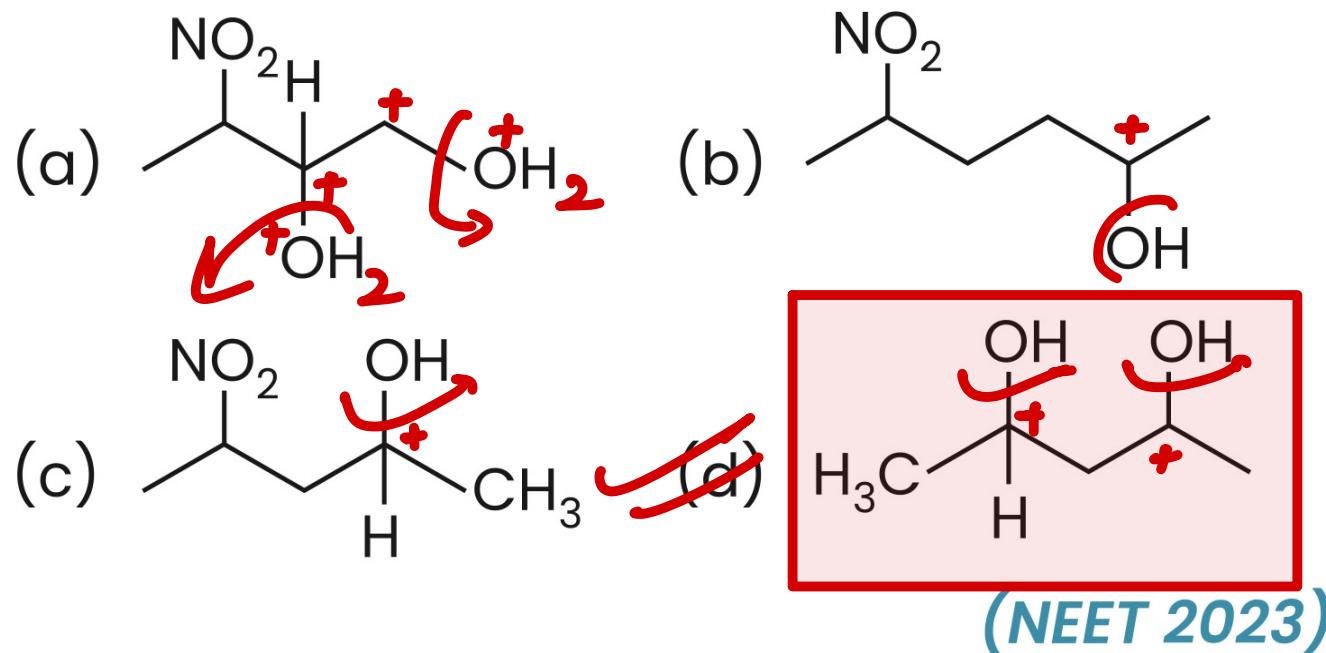
- (1)  $\text{H}_3\text{PO}_4$  and  $\text{POCl}_3$
- ~~(2)  $\text{H}_3\text{PO}_3$  and  $\text{POCl}_3$~~
- (3)  $\text{POCl}_3$  and  $\text{H}_3\text{PO}_3$
- (4)  $\text{POCl}_3$  and  $\text{H}_3\text{PO}_4$



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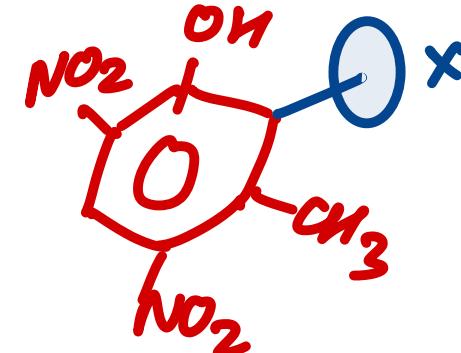
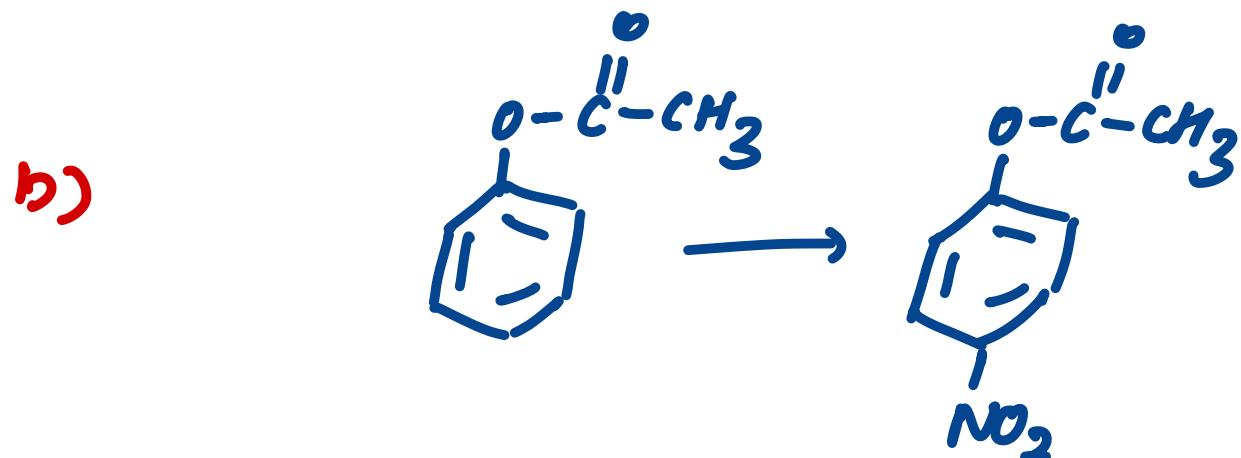
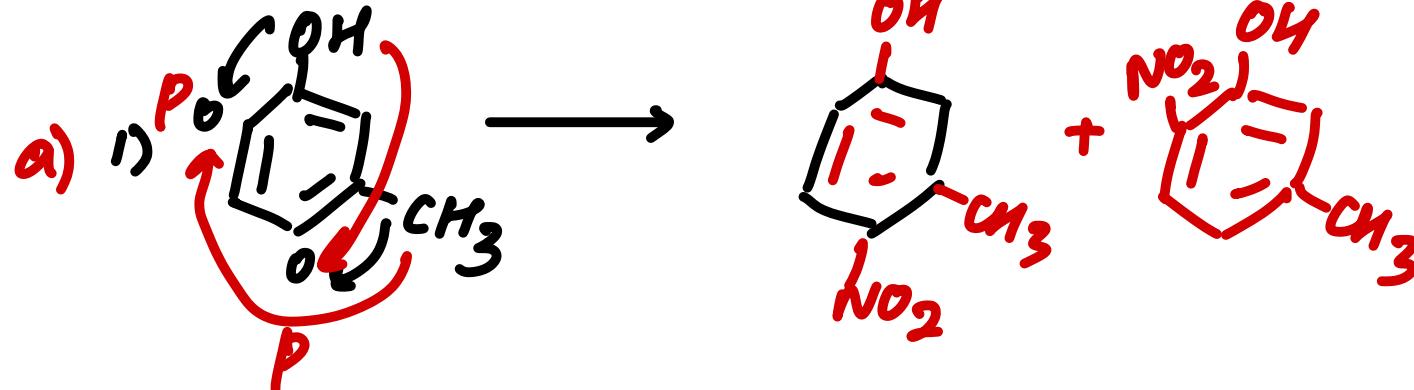
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Which amongst the following will be most readily dehydrated under acidic conditions?



Example 7.5 Write the structures of the major products expected from the following reactions:

- (a) Mononitration of 3-methylphenol
- (b) Dinitration of 3-methylphenol
- (c) Mononitration of phenyl methanoate.



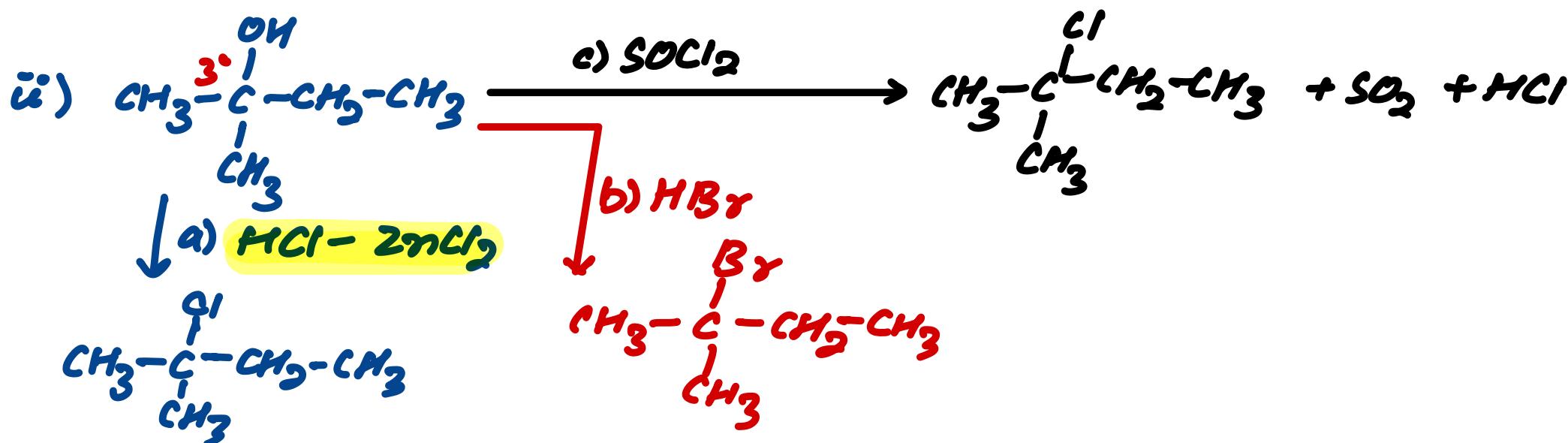
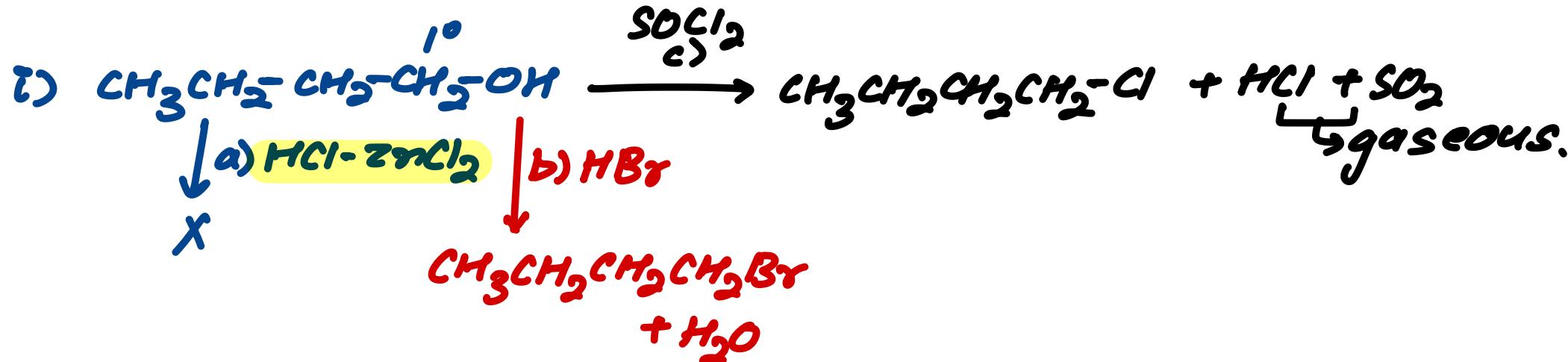
## Intext Questions

- 7.6 Give structures of the products you would expect when each of the following alcohol reacts with (a)  $\text{HCl} - \text{ZnCl}_2$ , (b)  $\text{HBr}$  and (c)  $\text{SOCl}_2$ .



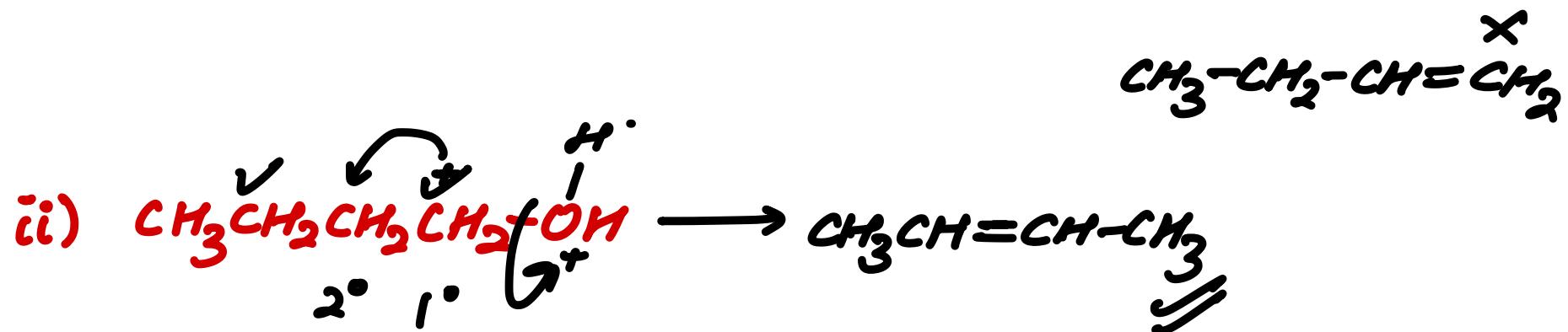
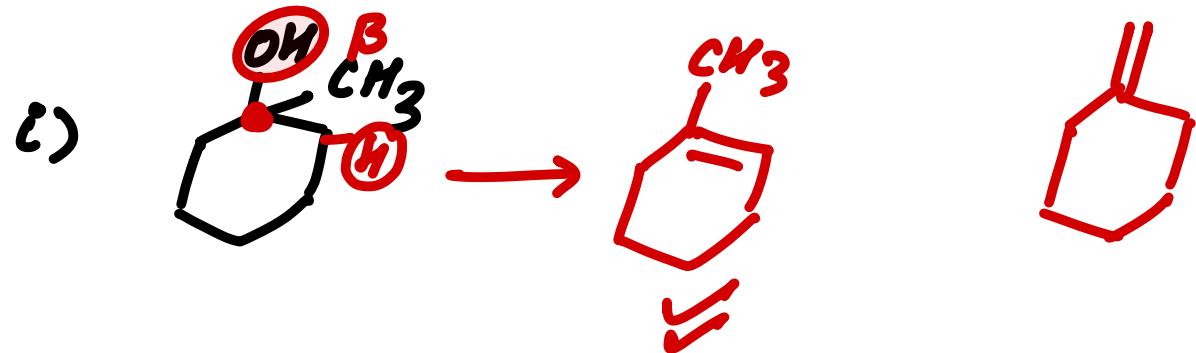
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7.7 Predict the major product of acid catalysed dehydration of

- (i) 1-methylcyclohexanol and (ii) butan-1-ol

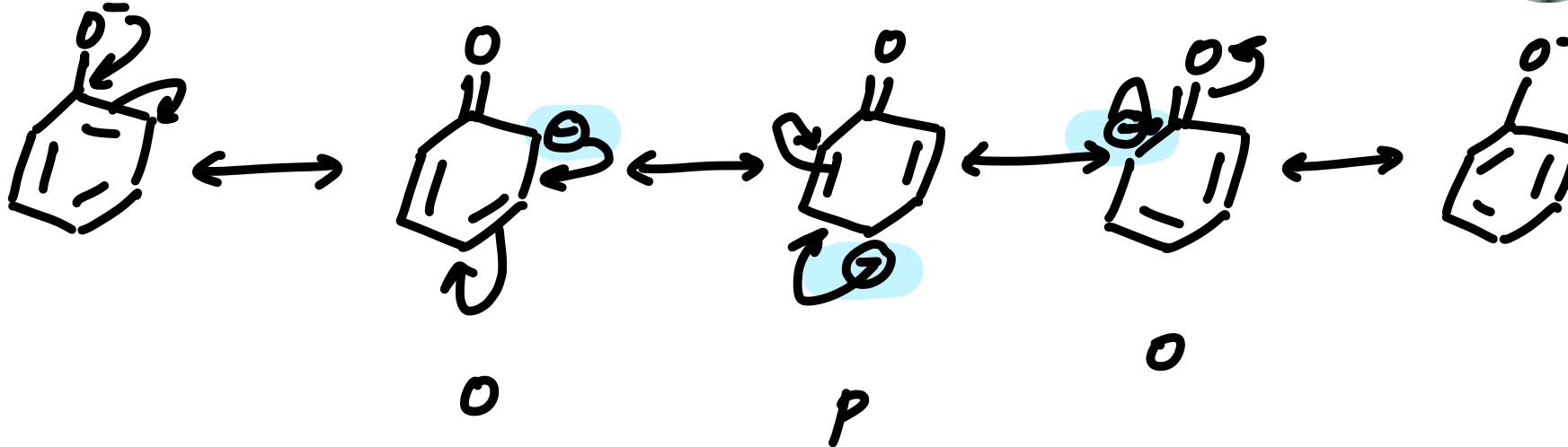


7.8 Ortho and para nitrophenols are more acidic than phenol. Draw the resonance structures of the corresponding phenoxide ions.



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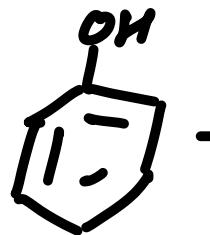


7.9 Write the equations involved in the following reactions:

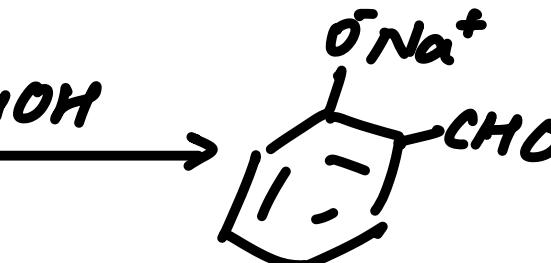
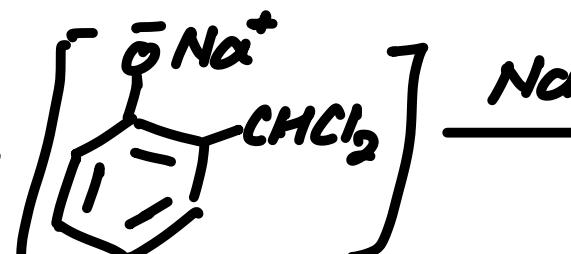
(i) Reimer - Tiemann reaction

(ii) Kolbe's reaction

i)



$\xrightarrow[\text{aq. NaOH}]{\text{CHCl}_3 +}$

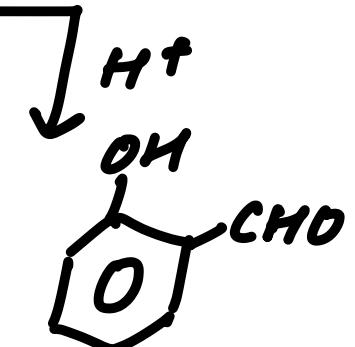


intermediate



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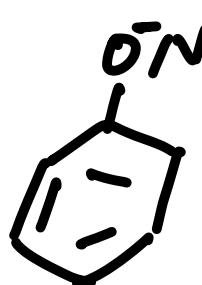
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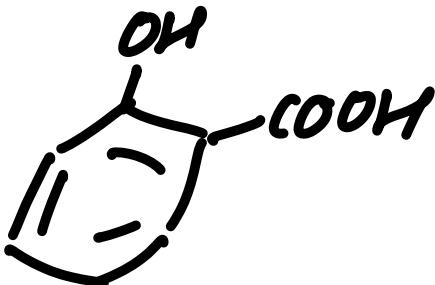
ii)



$\xrightarrow{\text{NaOH}}$

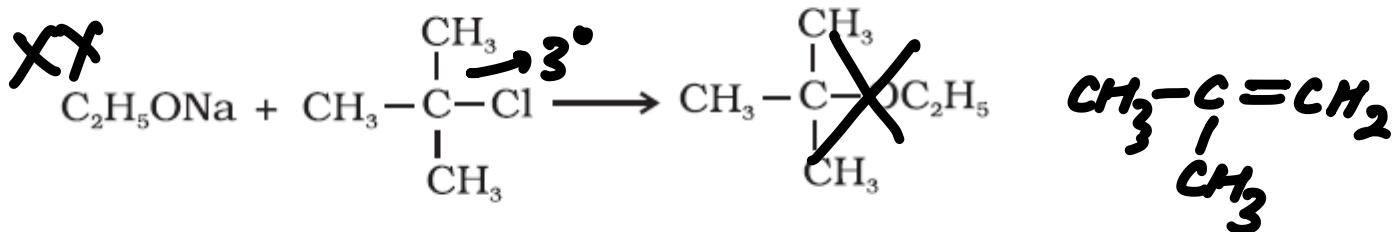


$\xrightarrow[\text{ii) H}^+]{\text{i) CO}_2}$



### Example 7.6

The following is not an appropriate reaction for the preparation of t-butyl ethyl ether.



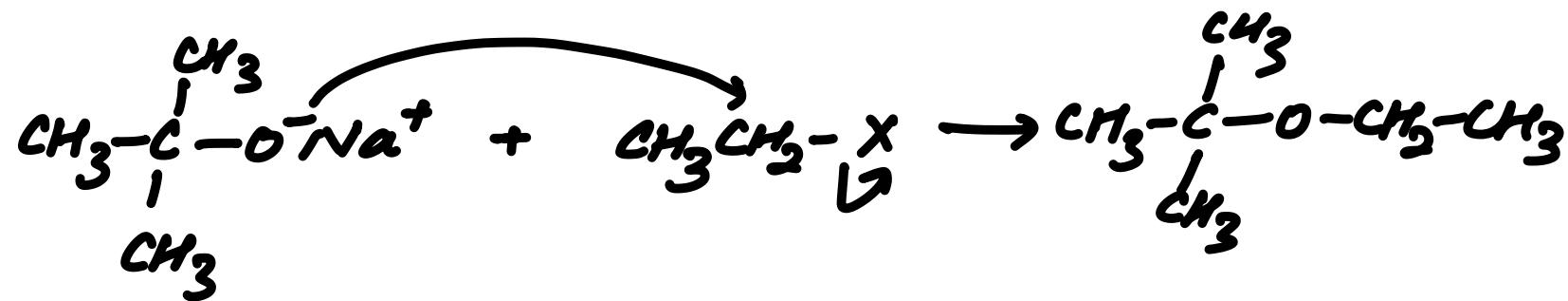
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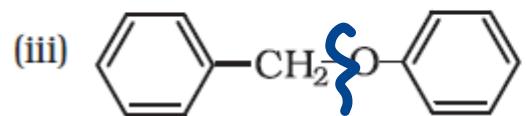
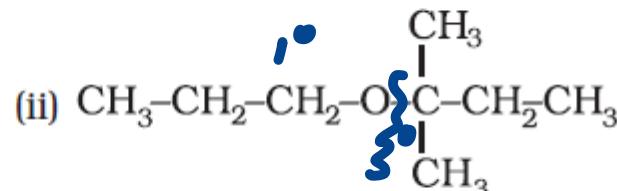
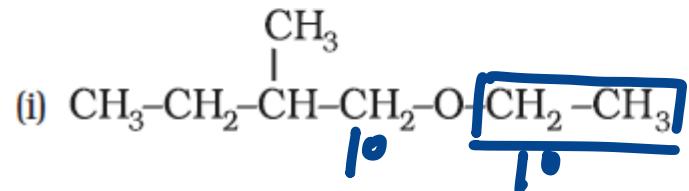
- (i) What would be the major product of this reaction ?
- (ii) Write a suitable reaction for the preparation of t-butylethyl ether.

↙

↓



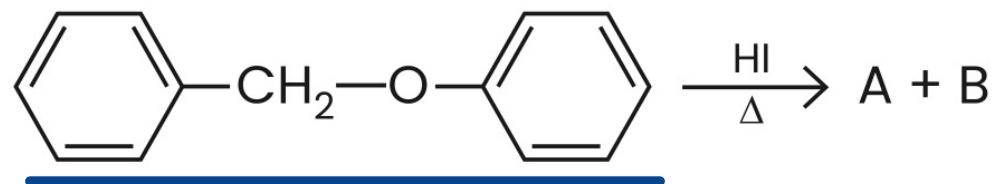
Give the major products that are formed by heating each of the following ethers with HI. Example 7.7



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Consider the following reaction :

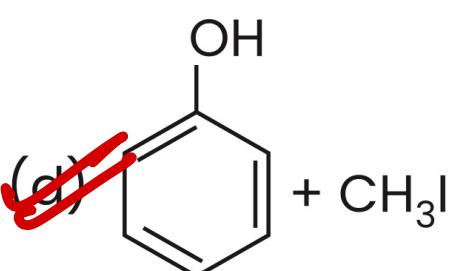
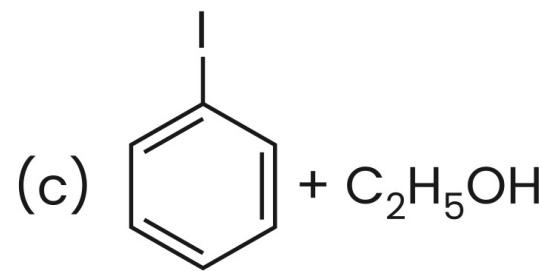
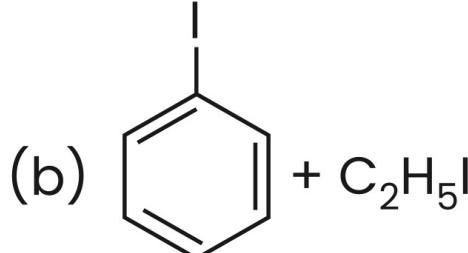
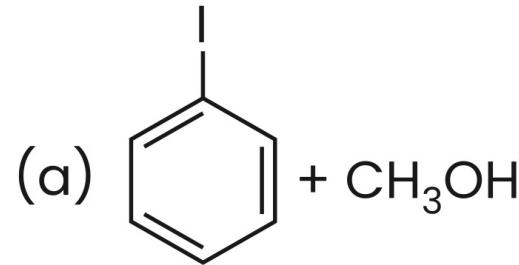


Identify products A and B.

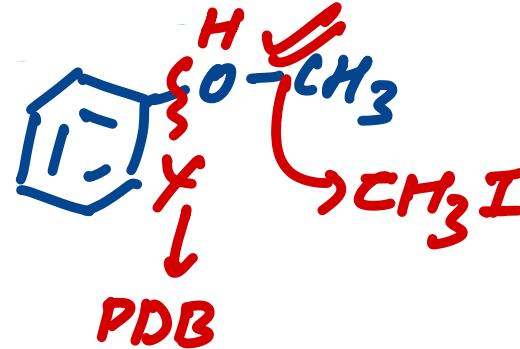
- (a) A =   
and B =   
~~(a)~~
- (b) A =   
and B =   
~~(b)~~
- (c) A =   
~~(c)~~ and B =   
~~(c)~~
- (d) A =   
~~(d)~~ and B =   
~~(d)~~

(NEET 2023)

Anisole on cleavage with HI gives :



*(NEET 2020)*

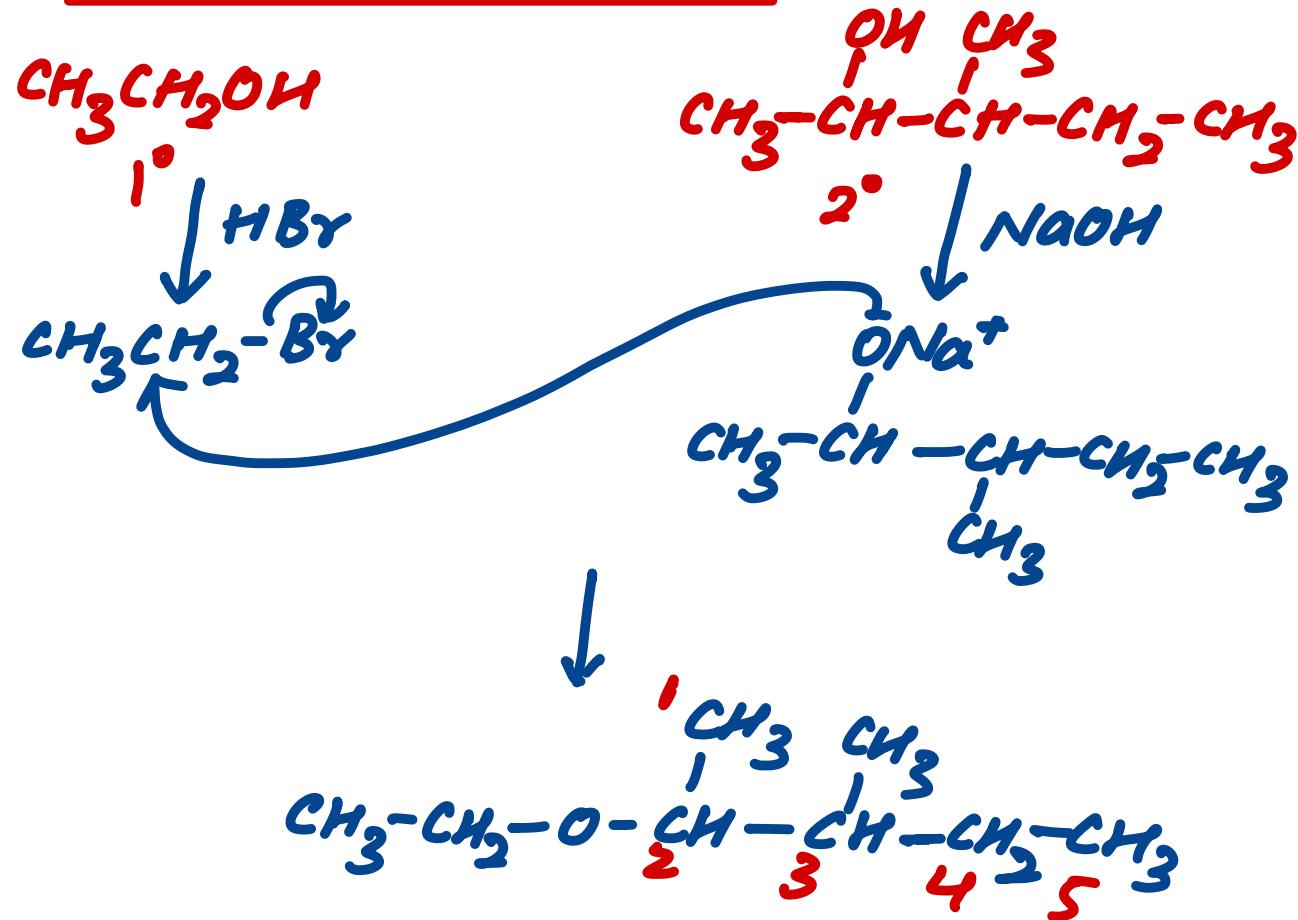
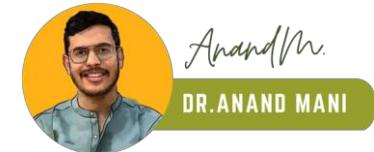


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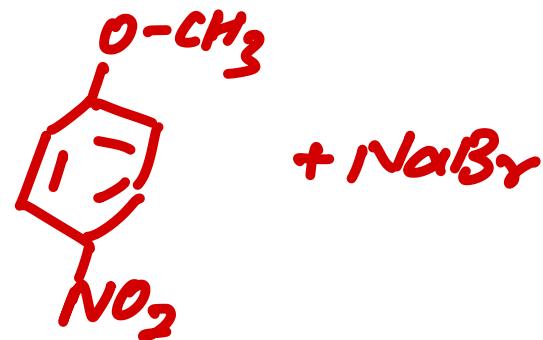
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## Intext Questions

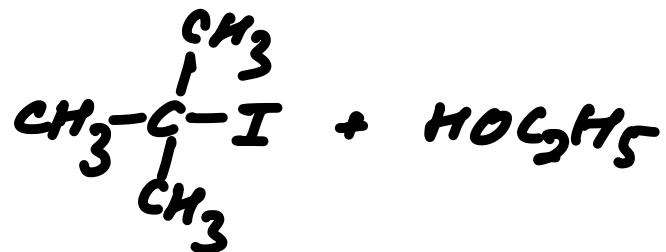
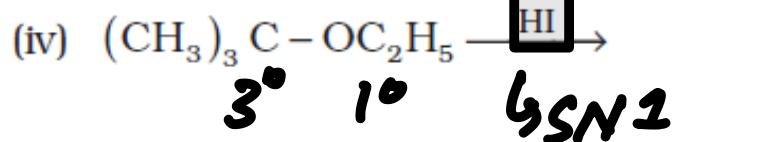
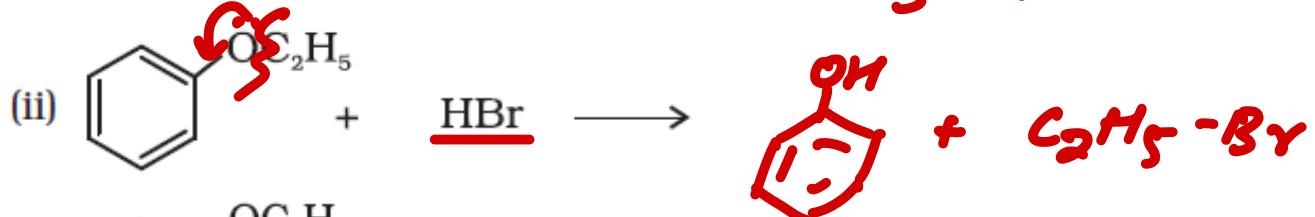
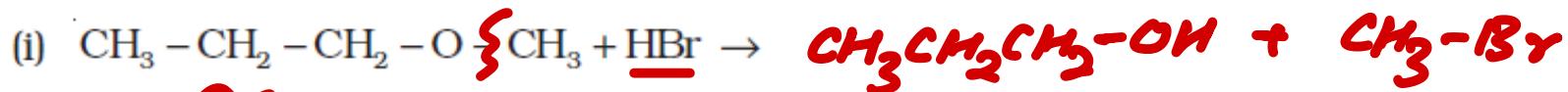
- 7.10 Write the reactions of Williamson synthesis of 2-ethoxy-3-methylpentane starting from ethanol and 3-methylpentan-2-ol.



7.11 Which of the following is an appropriate set of reactants for the preparation of 1-methoxy-4-nitrobenzene and why?

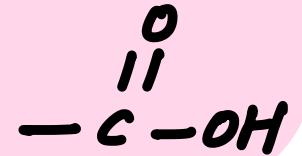


7.12 Predict the products of the following reactions:





# Aldehydes, ketones and Carboxylic acids



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## *Intext Questions*

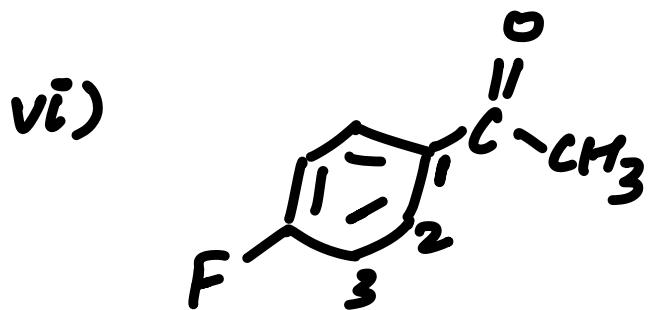
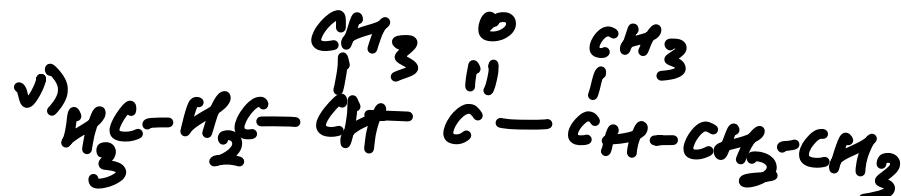
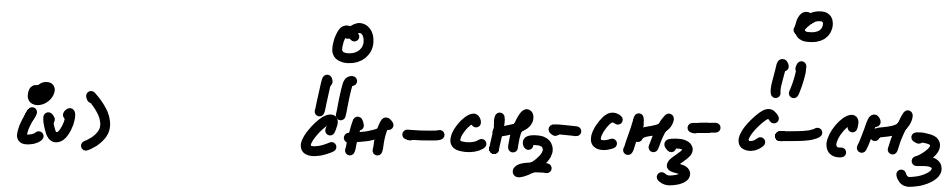
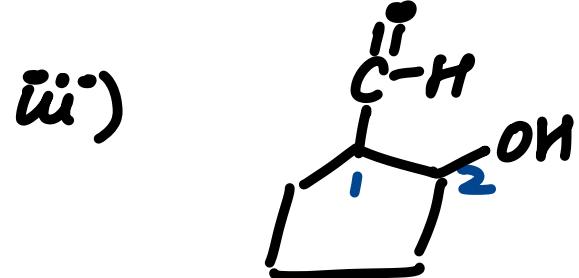
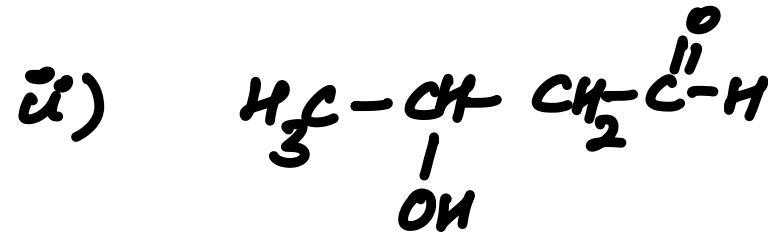
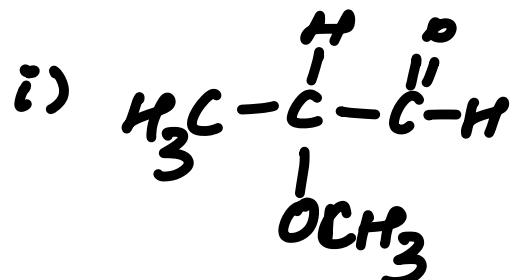
### 8.1 Write the structures of the following compounds.

- |   |                                  |
|---|----------------------------------|
| (i) <u><math>\alpha</math>-Methoxypropionaldehyde</u> | (ii) <u>3-Hydroxybutanal</u>     |
| (iii) <u>2-Hydroxycyclopentane carbaldehyde</u>       | (iv) <u>4-Oxopentanal</u>        |
| (v) <u>Di sec. butyl ketone</u>                       | (vi) <u>4-Fluoroacetophenone</u> |

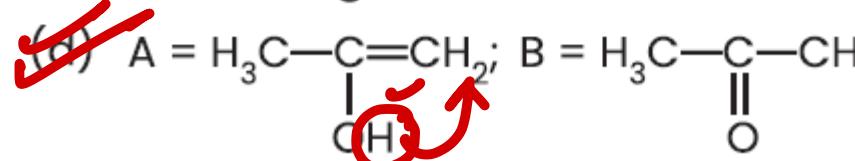
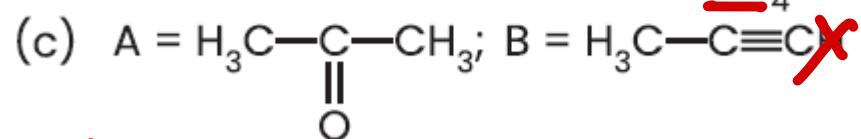
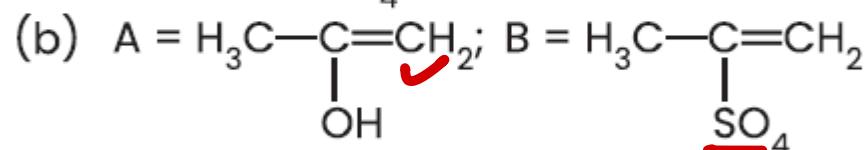
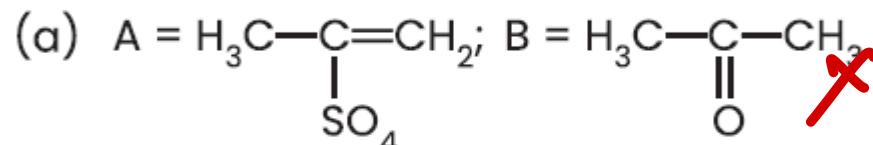
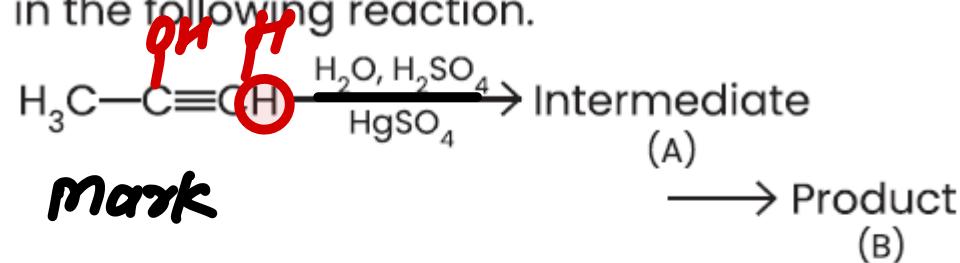


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Predict the correct intermediate and product in the following reaction.



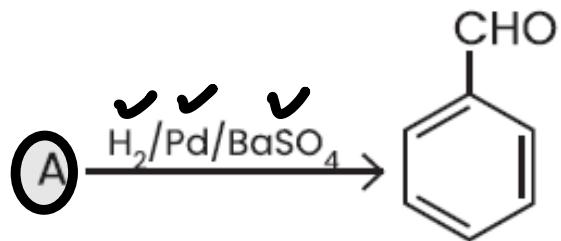
*(NEET 2017)*



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Identify compound (A) in the following reaction.

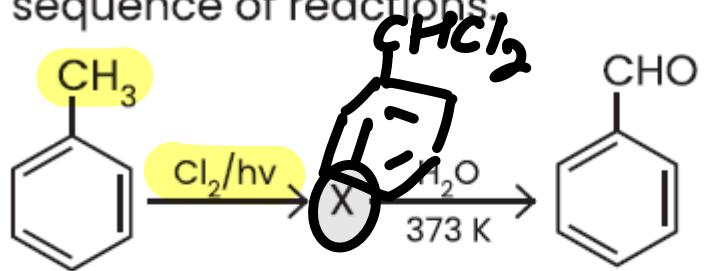


- ~~(a)~~ Benzoyl chloride (b) Toluene  
(c) Acetophenone (d) Benzoic acid



(NEET 2020)

Identify compound X in the following sequence of reactions.



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- (a)   
(b)  ~~(c)   
(d)~~

(NEET 2020)

### Example 8.1

Give names of the reagents to bring about the following transformations:

(i) Hexan-1-ol to hexanal

(iii) p-Fluorotoluene to

p-fluorobenzaldehyde

(v) Allyl alcohol to propenal

(ii) Cyclohexanol to cyclohexanone

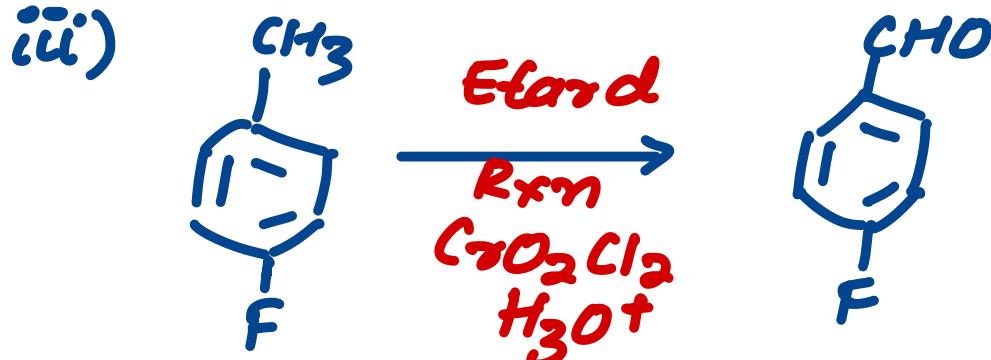
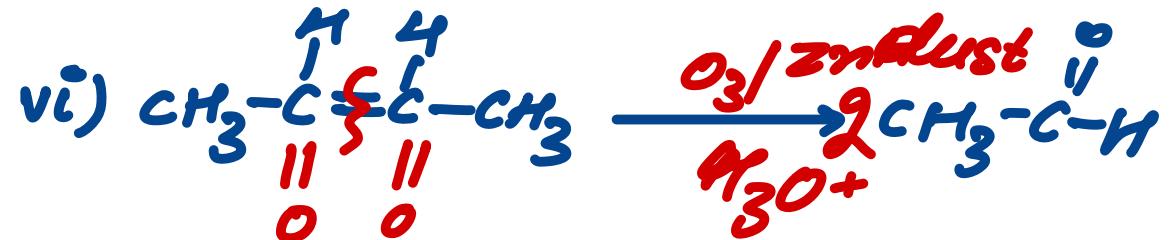
(iv) Ethanenitrile to ethanal

(vi) But-2-ene to ethanal



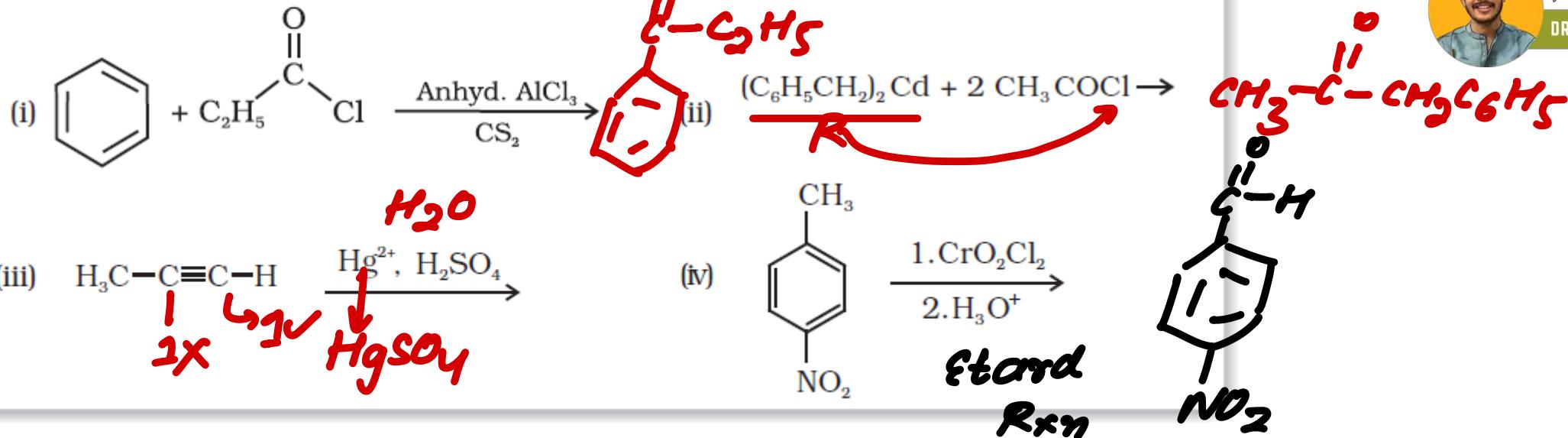
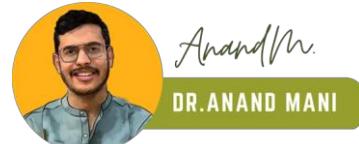
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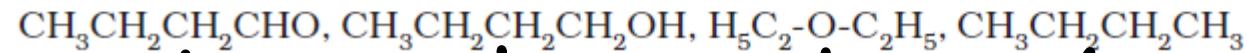


## Intext Question

8.2 Write the structures of products of the following reactions;



Arrange the following compounds in the increasing order of their boiling points:



at

↓  
alco

↓  
ether

↓  
stey

### Example 8.2



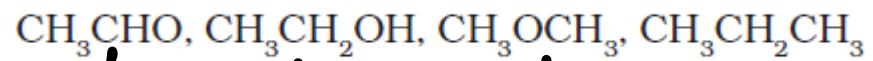
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### Intext Question

- 8.3 Arrange the following compounds in increasing order of their boiling points.



al      alco      ether      l-step



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Given below are two statements :

**Statement I:** The boiling points of aldehydes and ketones are higher than hydrocarbons of comparable molecular masses because of weak molecular association in aldehydes and ketones due to dipole-dipole interactions.



**Statement II:** The boiling points of aldehydes and ketones are lower than the alcohols of similar molecular masses due to the absence of H-bonding.



In the light of the above statements, choose the most appropriate answer from the given below:

- (a) Statement I is correct but Statement II is incorrect
- (b) Statement I is incorrect but Statement II is correct
- ~~(c)~~ Both Statement I and Statement II are correct
- (d) Both Statement I and Statement II are incorrect

(NEET 2022)

*alcohol > A/K > tly*

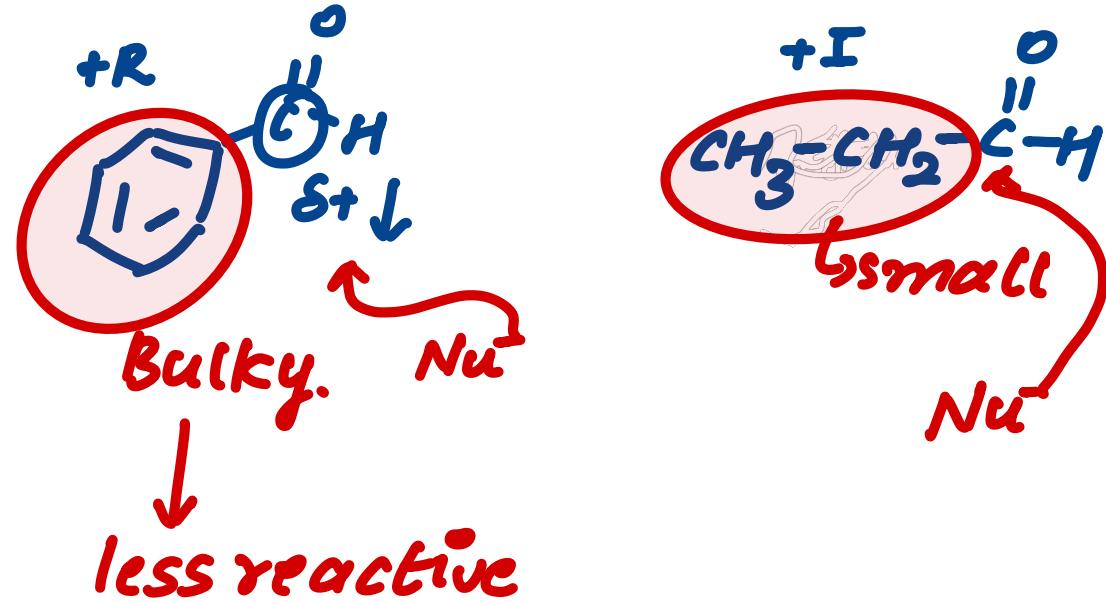
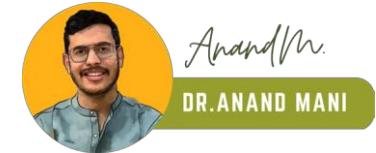


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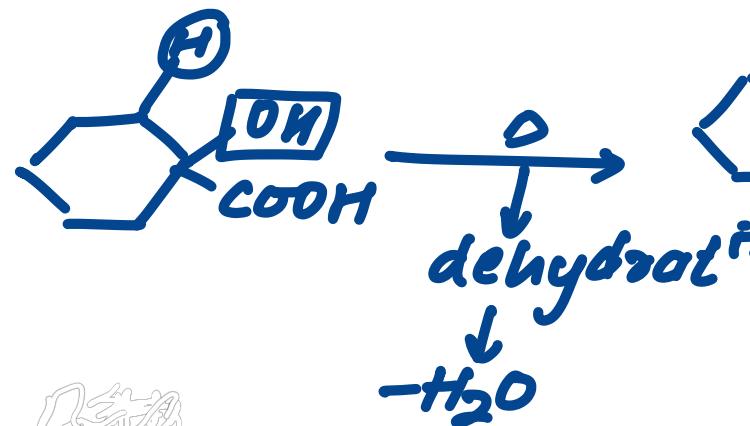
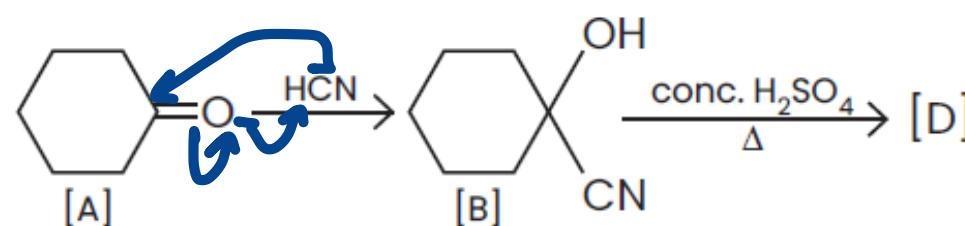
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### Example 8.3

Would you expect benzaldehyde to be more reactive or less ~~reactive~~ in nucleophilic addition reactions than propanal? Explain your answer.



Complete the following reaction



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[C] is .....

- (a) (b) (c) (d)

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Match List-I with List-II.

**List-I**

**(Products formed)**

(A) Cyanohydrin

(B) Acetal

(C) Schiff's base

(D) Oxime

**List-II**

**(Reaction of carbonyl compound with**

**HCN**

(i)  $\text{NH}_2\text{OH}$

(ii)  $\text{RNH}_2$

(iii) alcohol

(iv) HCN

**(Hydroxylamine)**

**(Amine)**

**(2)**



Choose the correct answer from the options given below :

(a) (A) - (i), (b) - (iii), (C) - (ii), (D) - (iv)

**(b) (A) - (iv), (B) - (iii), (C) - (ii), (D) - (i)**

(c) (A) - (iii), (B) - (iv), (C) - (ii), (D) - (i)

(d) (A) - (ii), (B) - (iii), (C) - (iv), (D) - (i)

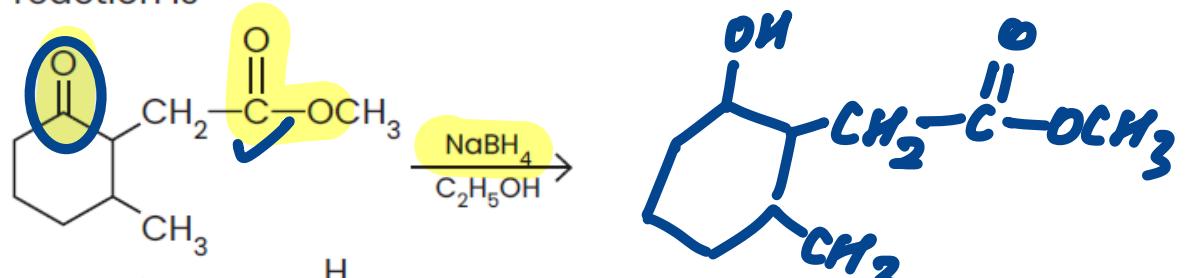
**(NEET 2022)**

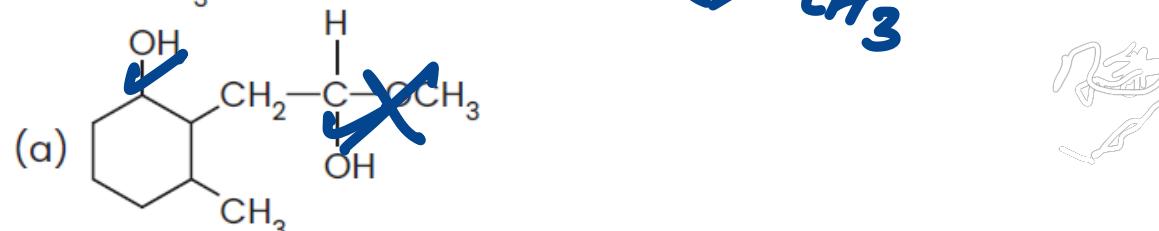
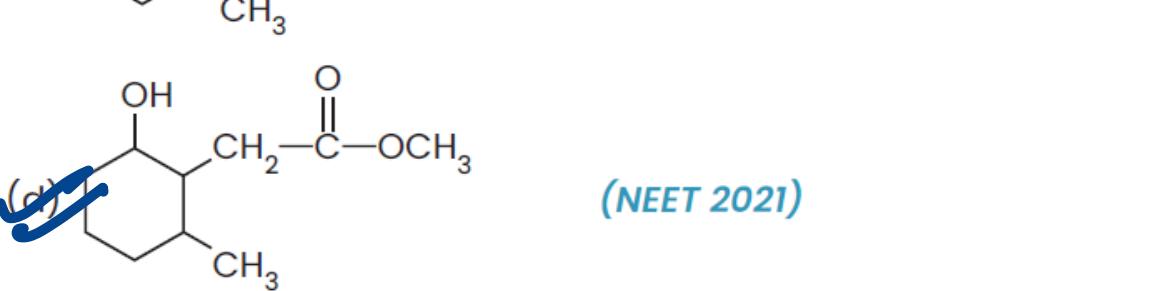


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The product formed in the following chemical reaction is



- (a) 
- (b) 
- (c) 
- (d) 

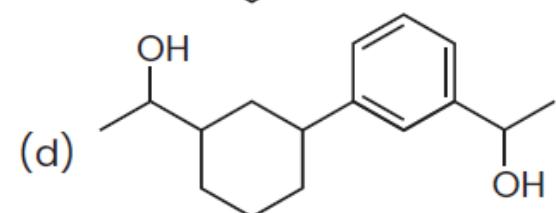
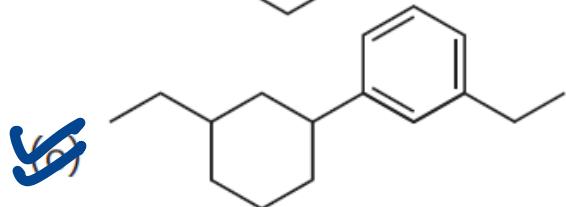
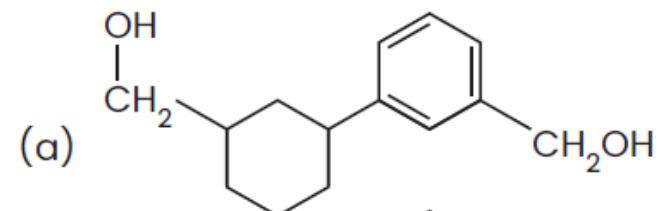
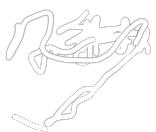
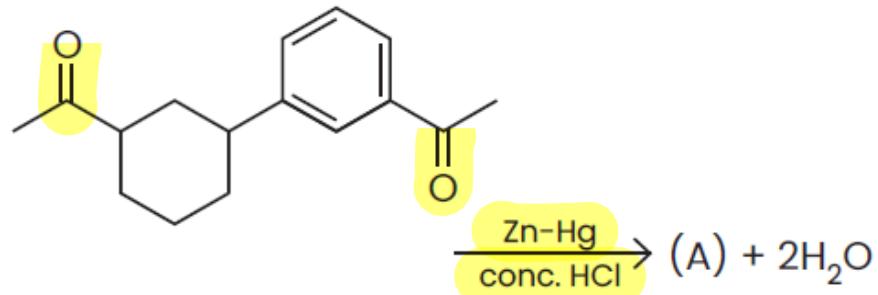
(NEET 2021)



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Identify product (A) in following reaction :



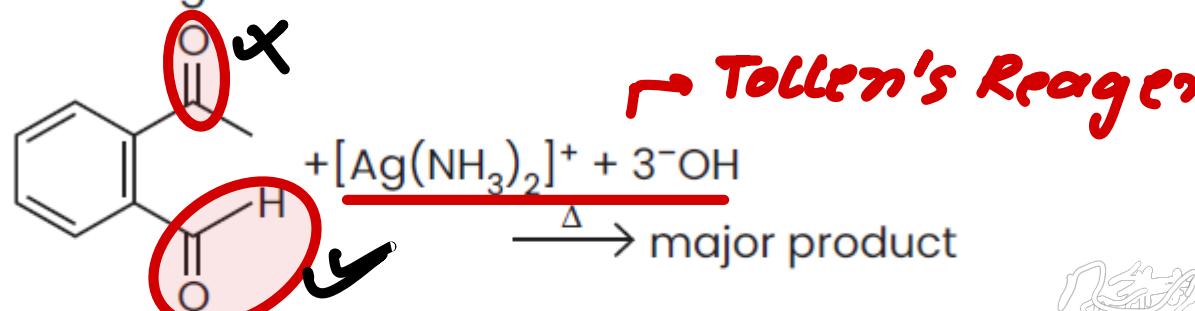
(NEET 2023)



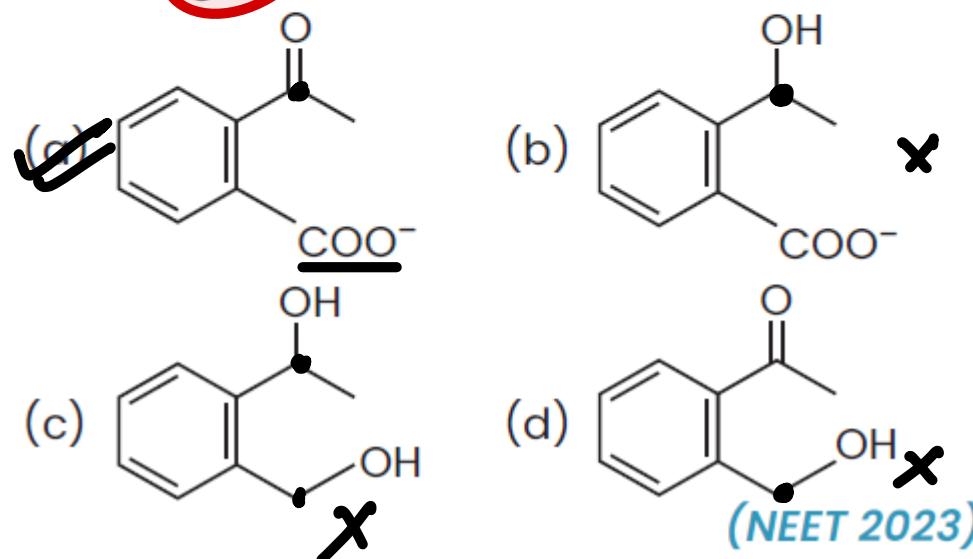
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Identify the major product obtained in the following reaction :



## → Tollen's Reagent



600'



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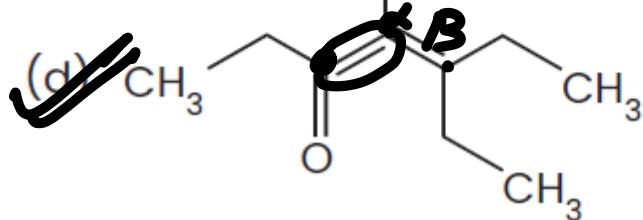
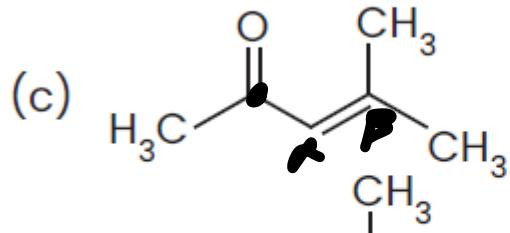
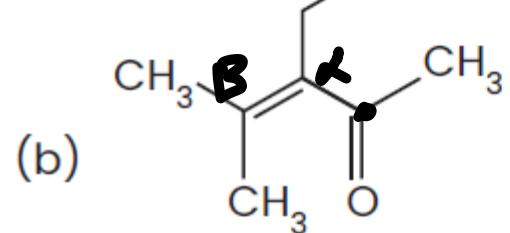
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Which one of the following is not formed when acetone reacts with 2-pentanone in the presence of dilute NaOH by heating?

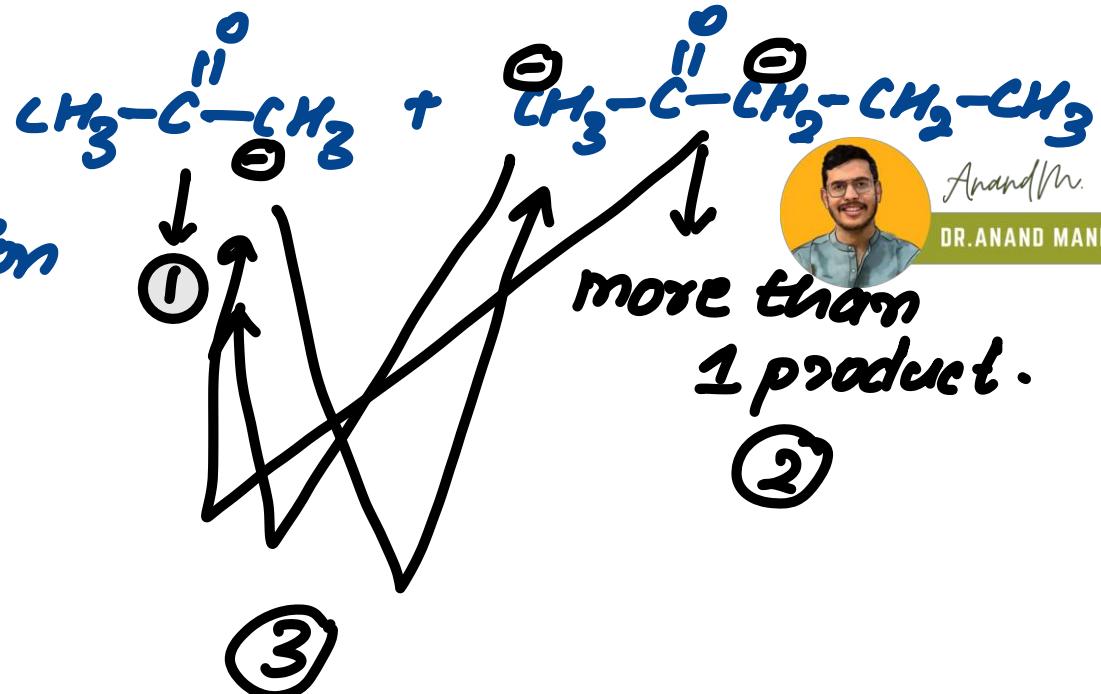
GaIdol Bondesation



H.W



(NEET 2022)



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### Intext Questions

8.4 Arrange the following compounds in increasing order of their reactivity in nucleophilic addition reactions.

- (i) Ethanal, Propanal, Propanone, Butanone.  
(ii) Benzaldehyde, p-Tolualdehyde, p-Nitrobenzaldehyde, Acetophenone.

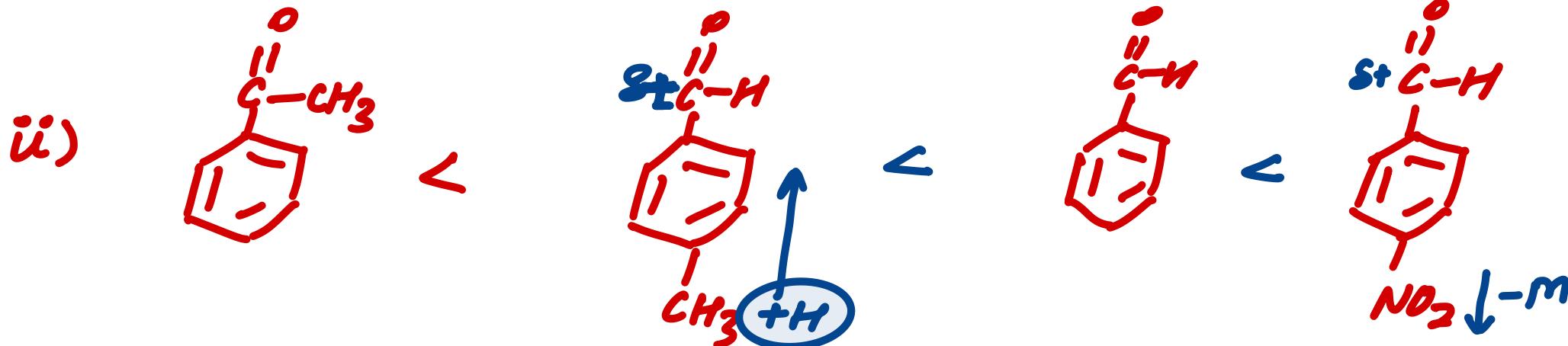
Hint: Consider steric effect and electronic effect.



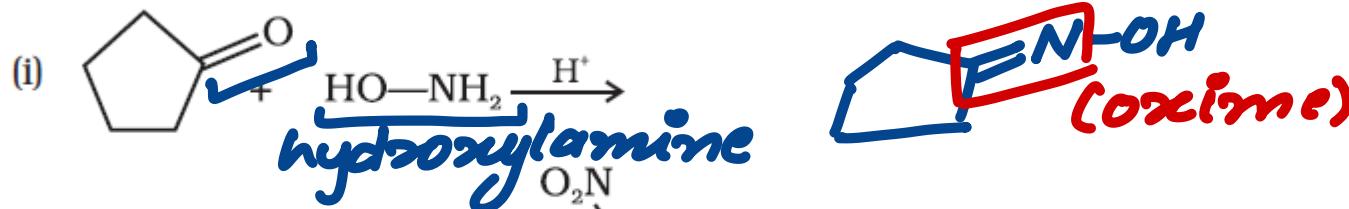
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i) **Butanone < Propanone < Propanal < Ethanal**

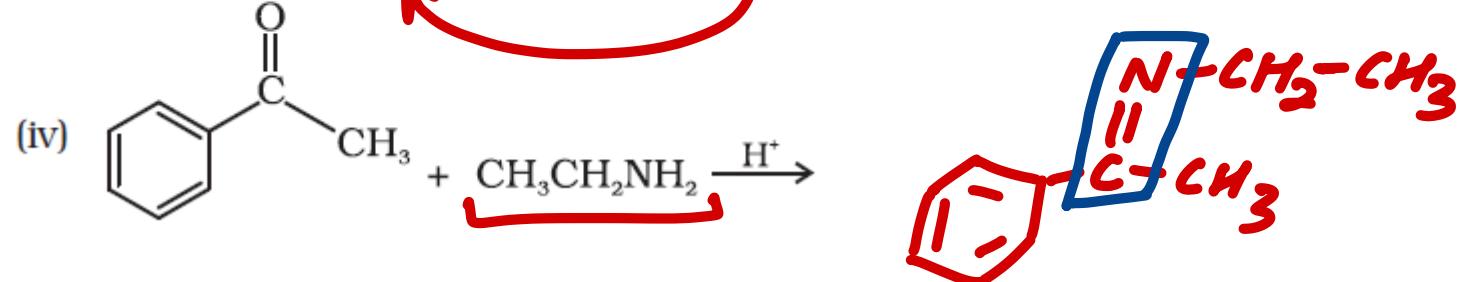
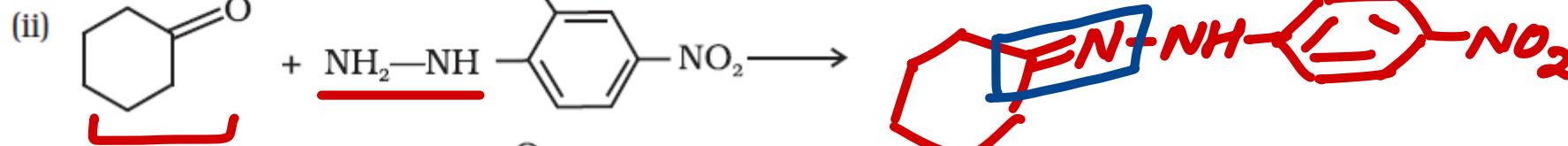


8.5 Predict the products of the following reactions:



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Reaction between benzaldehyde and acetophenone in presence of dilute NaOH is known as

**NCERT**

(a) Cannizzaro's reaction **X**

**Cann NaOH**

(b) Cross Cannizzaro's reaction **X**

(c) Cross aldol condensation

(d) Aldol condensation

**(NEET 2020)**

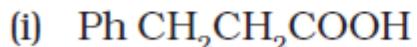


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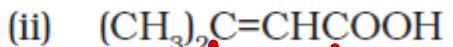
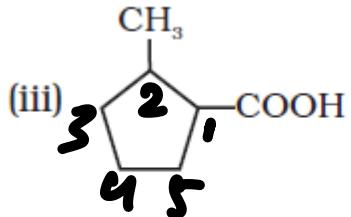
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### Intext Question

8.6 Give the IUPAC names of the following compounds:

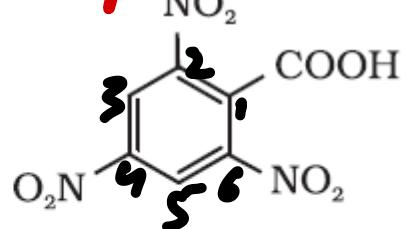


3 2 1



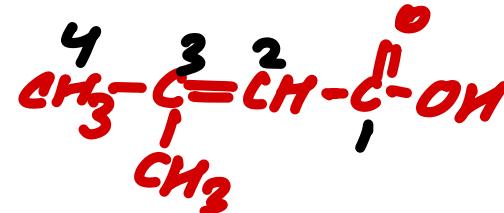
4 3 2 1

(iv)



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i) 3-phenylpropanoic Acid

ii) 3-Methylbut-2-en-1-Oic Acid.

iii) 2-Methylcyclopentanecarboxylic Acid.

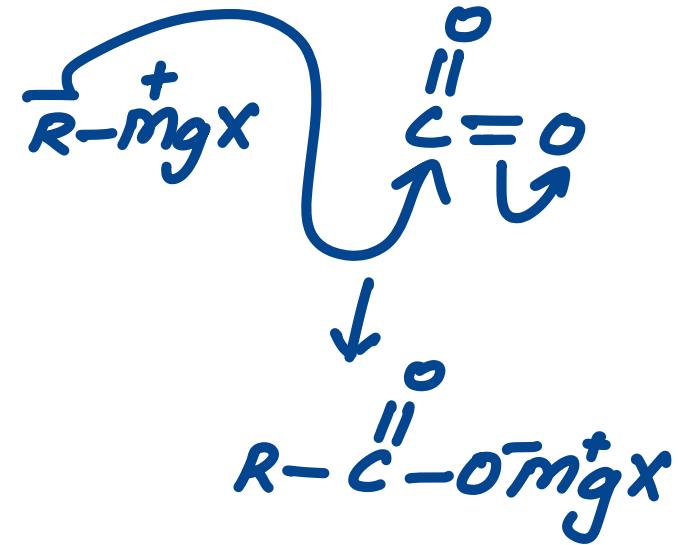
iv) 2,4,6-trinitobenzoic Acid.



What is Y in the above reaction?

- (a)  $\text{RCOO}^-\text{X}^+$  (b)  $(\text{RCO}^{\text{X}})_2\text{Mg}$   
~~(c)  $\text{RCOO}^-\text{Mg}^+\text{X}$~~  (d)  $\text{R}_3\text{CO}^-\text{Mg}^+\text{X}$

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Write chemical reactions to affect the following transformations:

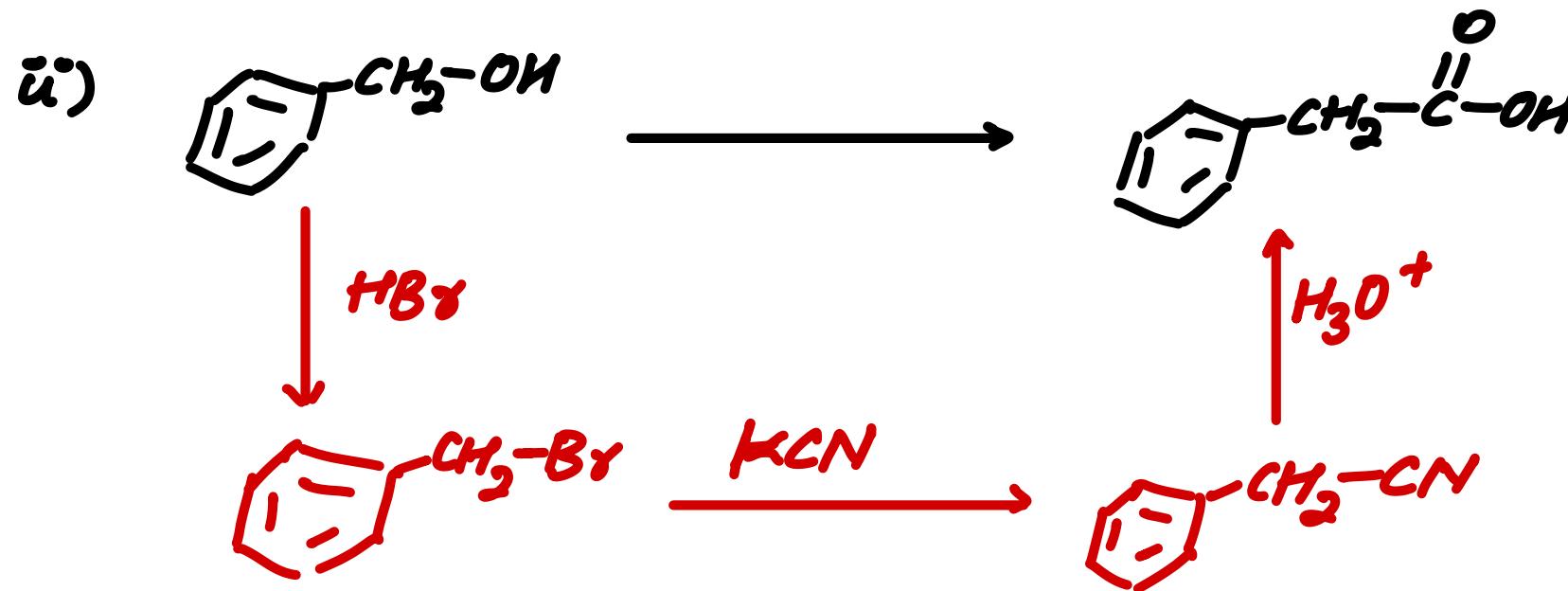
Example 8.5

- (i) Butan-1-ol to butanoic acid
- (ii) Benzyl alcohol to phenylethanoic acid
- (iii) 3-Nitrobromobenzene to 3-nitrobenzoic acid
- (iv) 4-Methylacetophenone to benzene-1,4-dicarboxylic acid
- (v) Cyclohexene to hexane-1,6-dioic acid
- (vi) Butanal to butanoic acid.



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Write chemical reactions to affect the following transformations:

Example 8.5

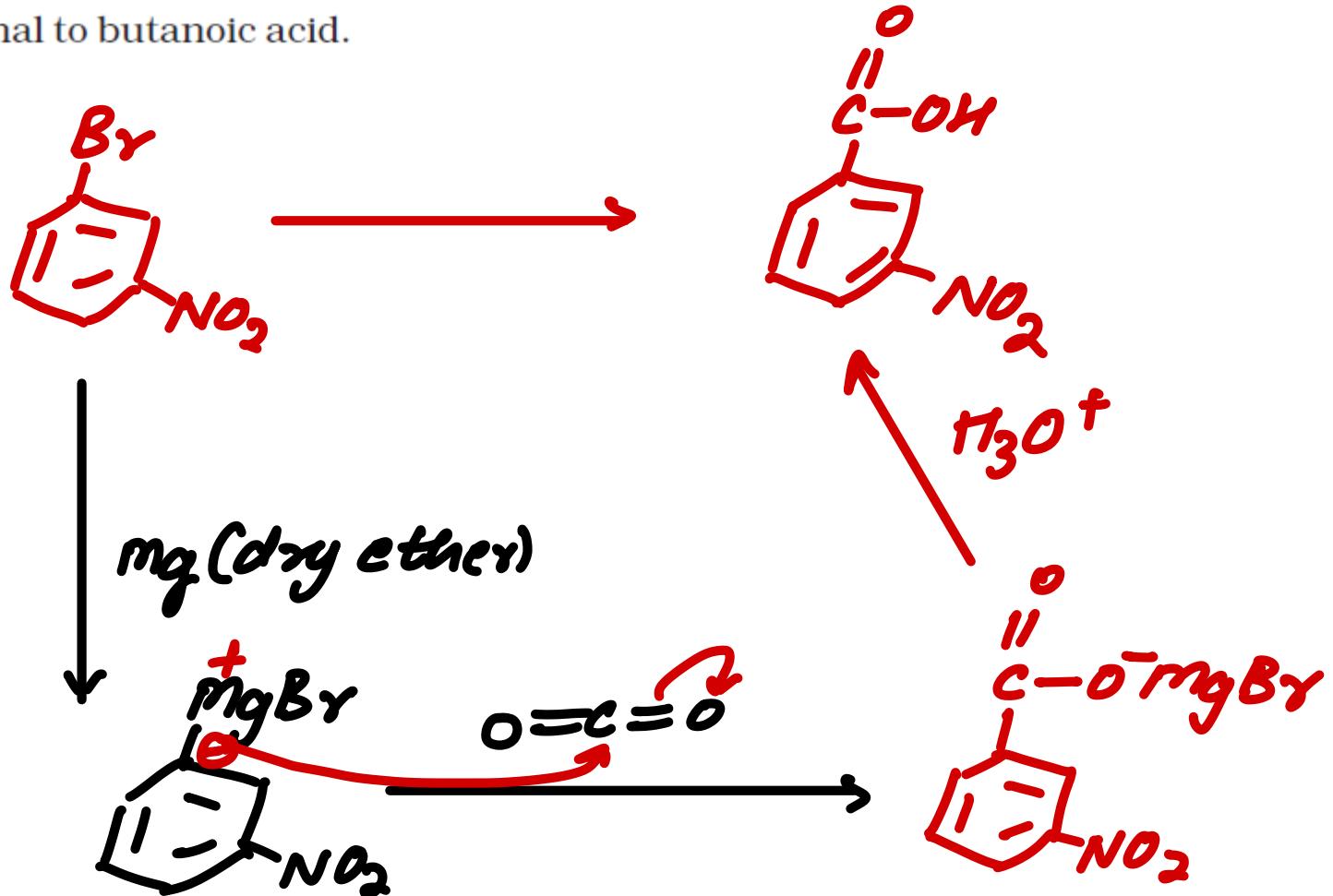
- (i) Butan-1-ol to butanoic acid
- (ii) Benzyl alcohol to phenylethanoic acid
- (iii) 3-Nitrobromobenzene to 3-nitrobenzoic acid
- (iv) 4-Methylacetophenone to benzene-1,4-dicarboxylic acid
- (v) Cyclohexene to hexane-1,6-dioic acid
- (vi) Butanal to butanoic acid.



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iii)



Write chemical reactions to affect the following transformations:

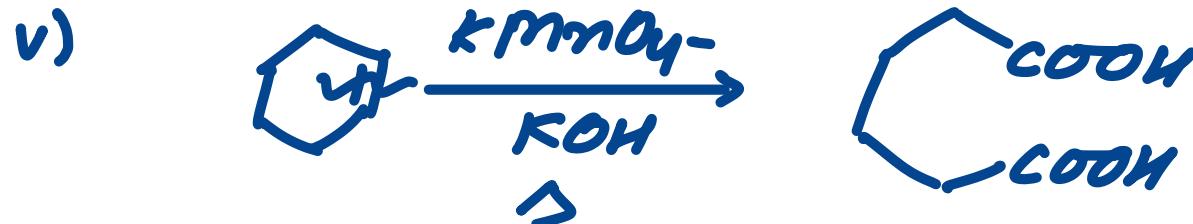
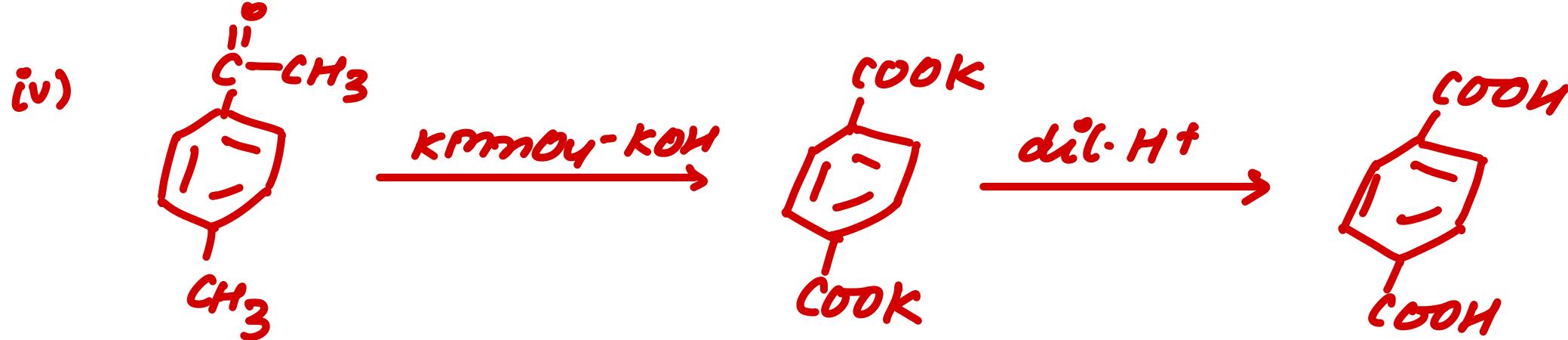
Example 8.5

- (i) Butan-1-ol to butanoic acid
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- (vi) Butanal to butanoic acid.



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Write chemical reactions to affect the following transformations:

Example 8.5

- (i) Butan-1-ol to butanoic acid
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- (iv) 4-Methylacetophenone to benzene-1,4-dicarboxylic acid
- (v) Cyclohexene to hexane-1,6-dioic acid
- (vi) Butanal to butanoic acid.



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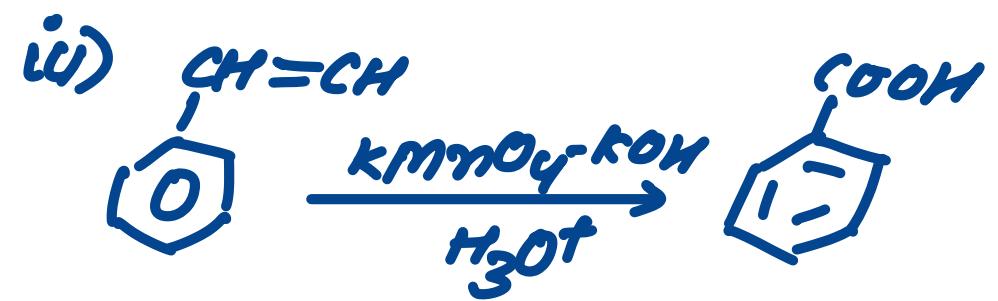
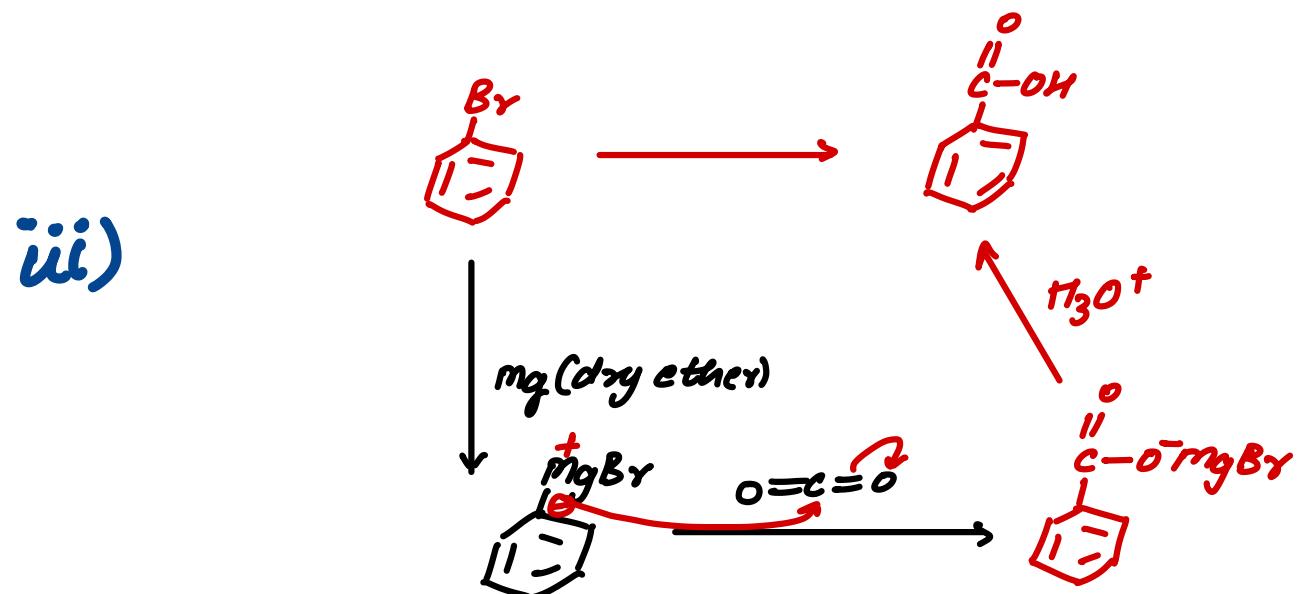
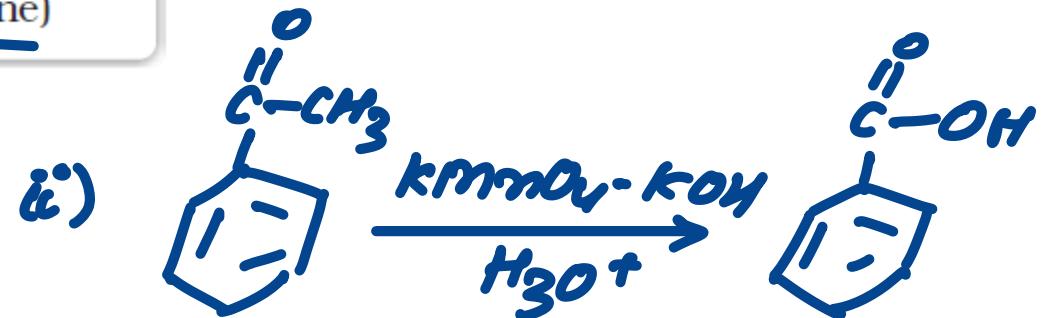
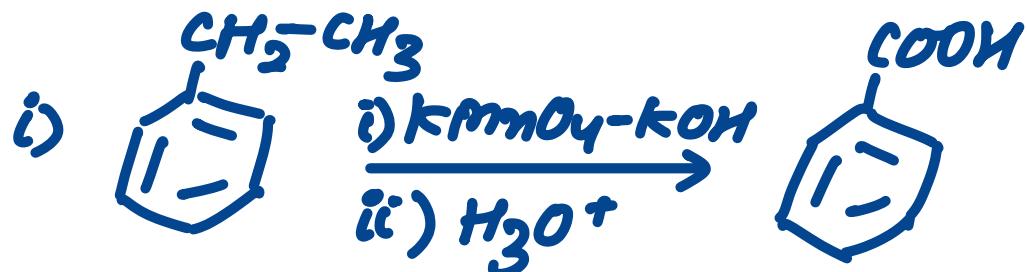
## Intext Question

- 8.7 Show how each of the following compounds can be converted to benzoic acid.
- Ethylbenzene
  - Acetophenone
  - Bromobenzene
  - Phenylethene (Styrene)



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Carboxylic acids have higher boiling points than aldehydes, ketones and even alcohols of comparable molecular mass. It is due to their

- (a) more extensive association of carboxylic acid via van der Waals' force of attraction ~~✓~~
- (b) formation of carboxylate ion ~~✗~~
- (c) formation of intramolecular H-bonding
- (d) formation of intermolecular H-bonding

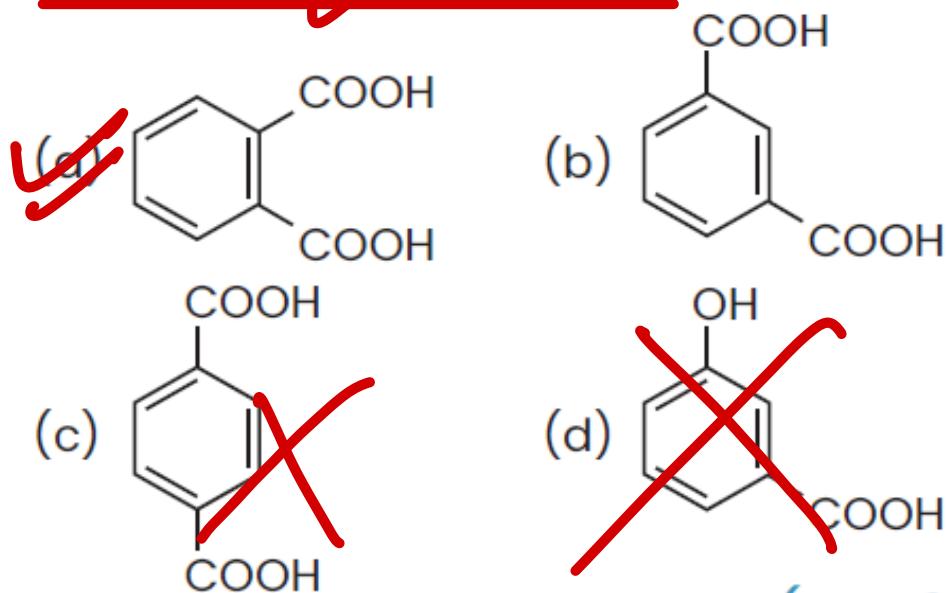
(NEET 2018)



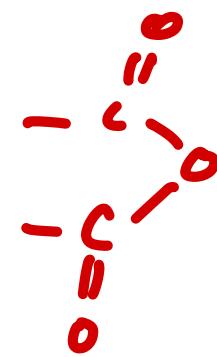
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Which of the following acid will form an (i) anhydride on heating and (ii) acid imide on strong heating with ammonia?



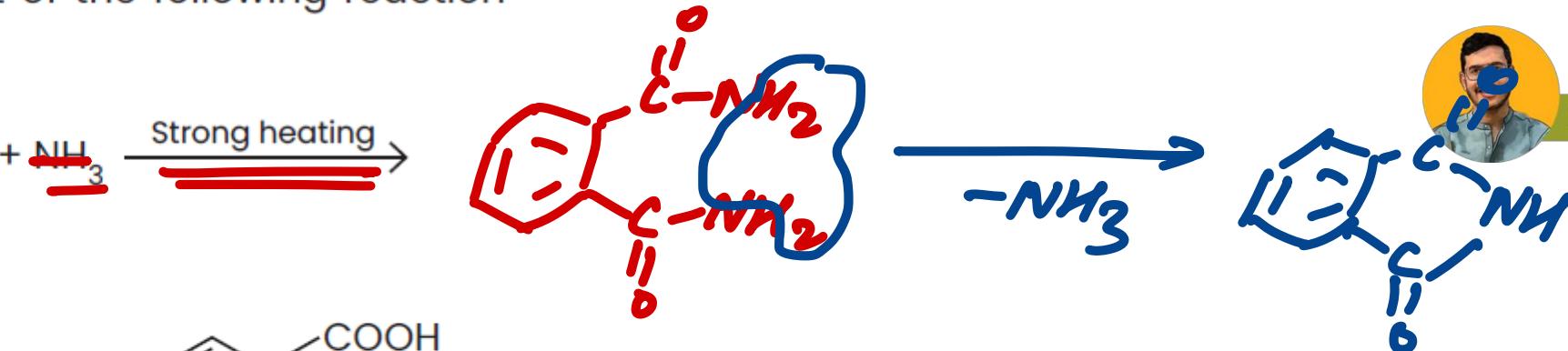
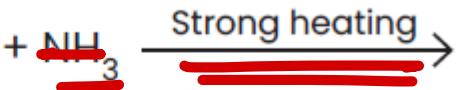
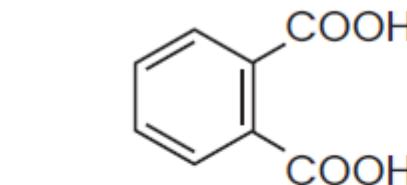
(NEET 2020)



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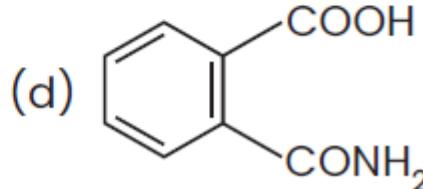
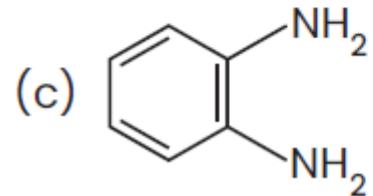
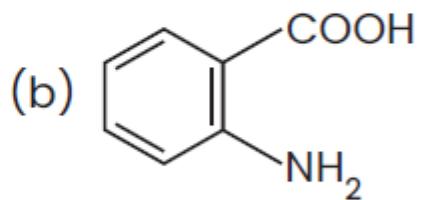
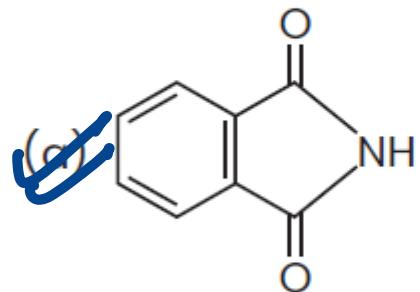
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The major product of the following reaction is:



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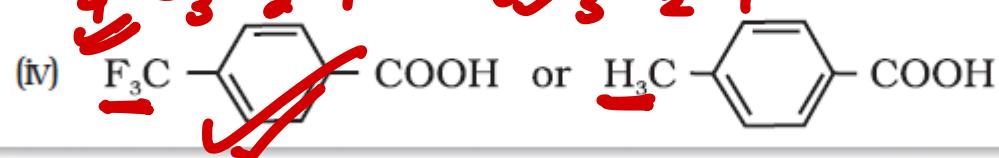
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(NEET 2019)

## Intext Question

8.8 Which acid of each pair shown here would you expect to be stronger?



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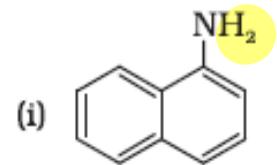
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# AMINES

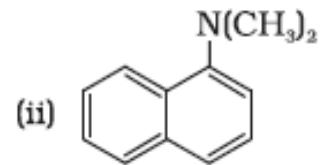


## Intext Questions

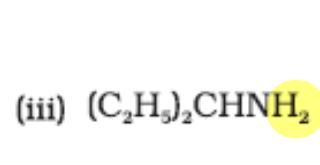
9.1 Classify the following amines as primary, secondary or tertiary:



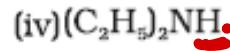
1°



3°



1°



2°

**2H → 1°**  
**1H → 2°**  
**OH → 3°**



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- 9.2 (i) Write structures of different isomeric amines corresponding to the molecular formula,  $C_4H_{11}N$ .  
 (ii) Write IUPAC names of all the isomers.  
 (iii) What type of isomerism is exhibited by different pairs of amines?

*a/b*  $\xrightarrow{PI}$   
*c/d*  
*c/g*

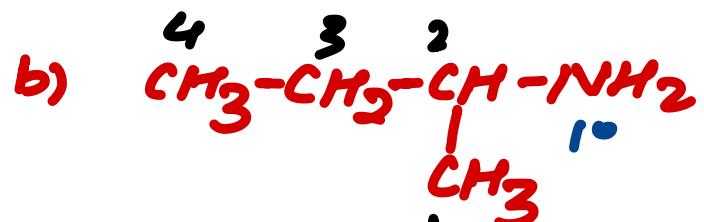
*a/c*  
*a/d*  
*b/c*  
*b/d*

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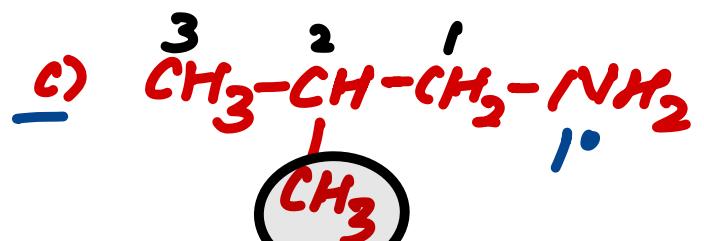
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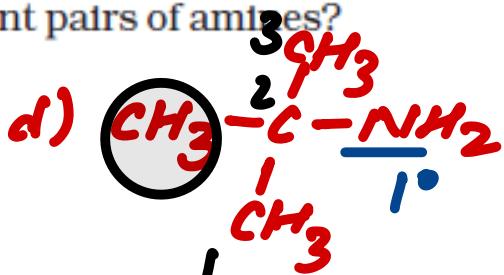
Butanamine



Butan-2-amine



2-Methylpropanamine



2-Methylpropan-2-amine



N-Methylpropanamine



N-Ethylethanamine



N-Methylpropan-2-amine



*N,N*-dimethyl  
ethanamine

*c/f*  $\xrightarrow{CI}$   
*f/g*  $\xrightarrow{CI}$  meta.

Write chemical equations for the following reactions:

Example 9.1

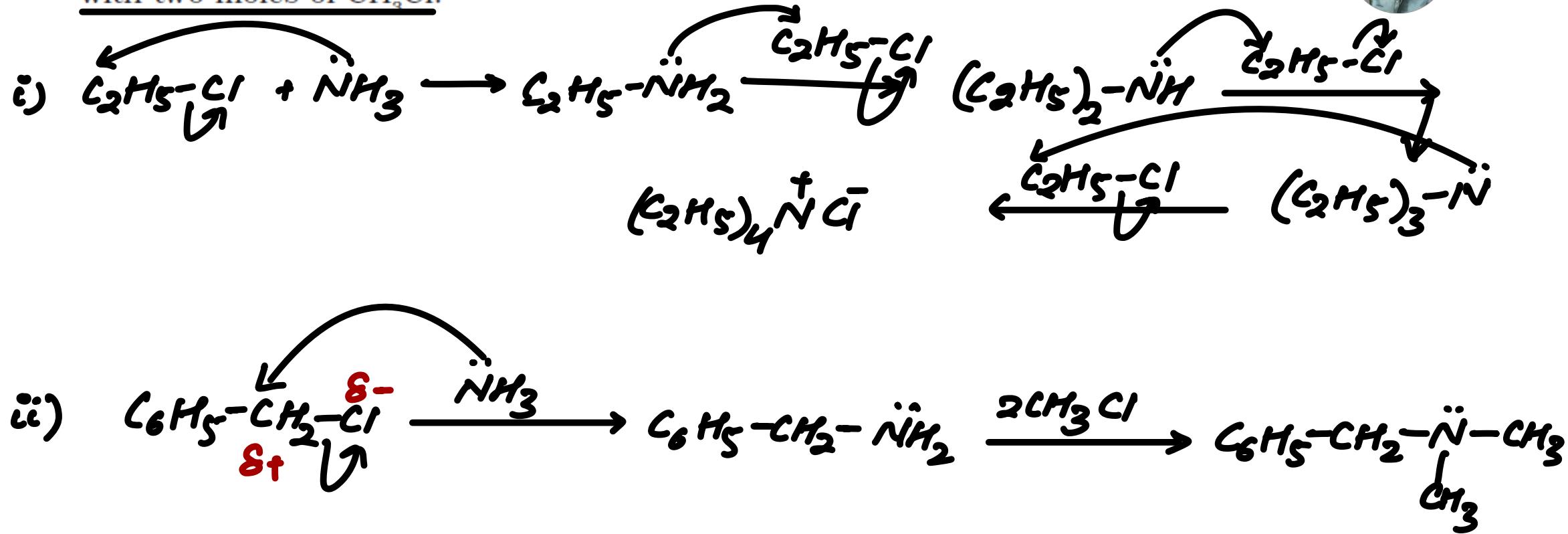
(i) Reaction of ethanolic  $\text{NH}_3$  with  $\text{C}_2\text{H}_5\text{Cl}$ .

(ii) Ammonolysis of benzyl chloride and reaction of amine so formed with two moles of  $\text{CH}_3\text{Cl}$ .



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Reaction of propanamide with ethanolic sodium hydroxide and bromine will give

- ~~(a)~~ ethylamine      (b) methylamine  
(c) propylamine      (d) aniline

(NEET 2020)



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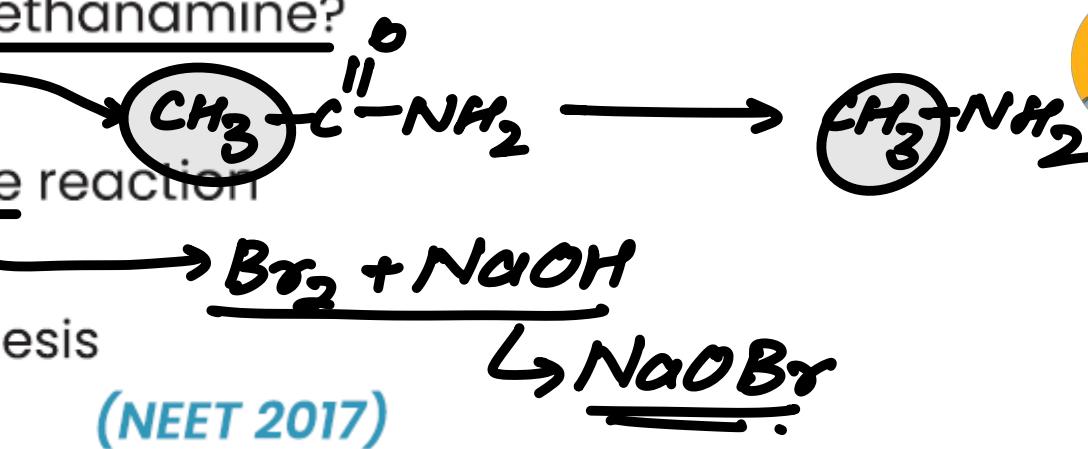
Which of the following reactions is appropriate for converting acetamide to methanamine?

(a) Carbylamine reaction

~~(b)~~ Hoffmann hypobromamide reaction

(c) Stephen's reaction

(d) Gabriel's phthalimide synthesis



(NEET 2017)



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Which of the following reactions will NOT give primary amine as the product?

~~(d)~~  $\text{CH}_3\text{NC} \xrightarrow[\text{(ii) } \text{H}_3\text{O}^\oplus]{\text{(i) } \text{LiAlH}_4} \text{Product} \quad \text{CH}_3-\text{NH}-\text{CH}_3$

(b)  $\text{CH}_3\text{CONH}_2 \xrightarrow[\text{(ii) H}_3\text{O}^\oplus]{\text{(i) LiAlH}_4} \text{Product}$   $\text{CH}_3\text{CH}_2-\text{NH}_2 \rightarrow \text{I}^\bullet$

(c)  $\text{CH}_3\text{CONH}_2 \xrightarrow{\text{Br}_2/\text{KOH}}$  Product  $\text{CH}_3\text{NH}_2 \rightarrow 1^\circ$

(d)  $\text{CH}_3\text{CN} \xrightarrow[\text{(ii) } \text{H}_3\text{O}^\oplus]{\text{(i) } \text{LiAlH}_4} \text{Product}$  (NEET 2023)

$2H \rightarrow 1^o$   
 $1H \rightarrow 2^o$   
 $0H \rightarrow 3^o$



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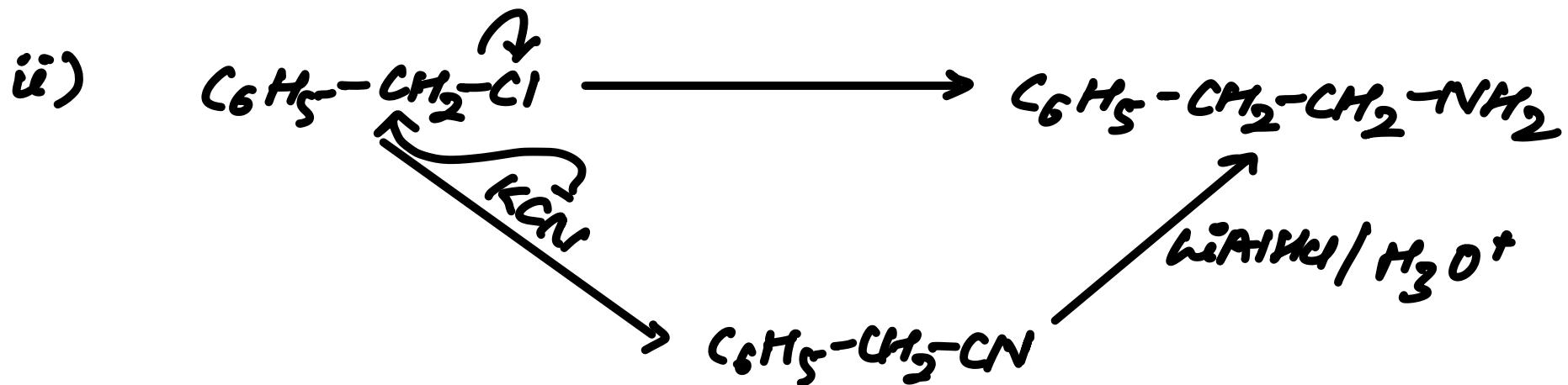
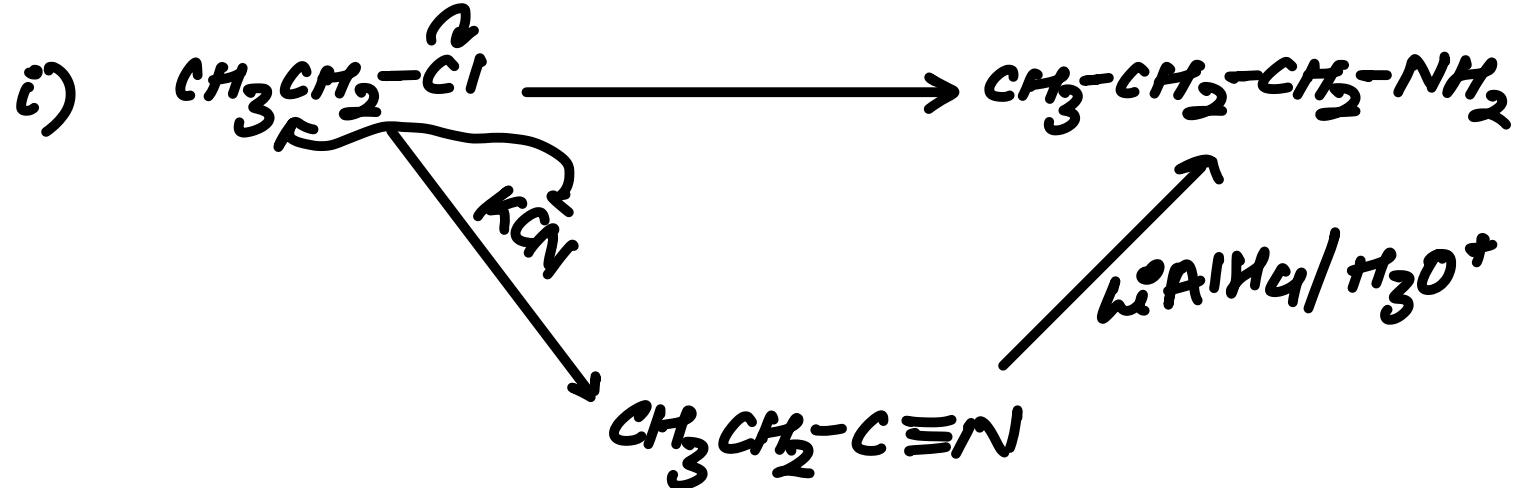
### Example Q.2

Write chemical equations for the following conversions:

- (i)  $\text{CH}_3\text{CH}_2\text{Cl}$  into  $\text{CH}_3\text{CH}_2\text{CH}_2\text{NH}_2$   
(ii)  $\text{C}_6\text{H}_5\text{CH}_2\text{Cl}$  into  $\text{C}_6\text{H}_5\text{CH}_2\text{CH}_2\text{NH}_2$



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Write structures and IUPAC names of

Example 0.3

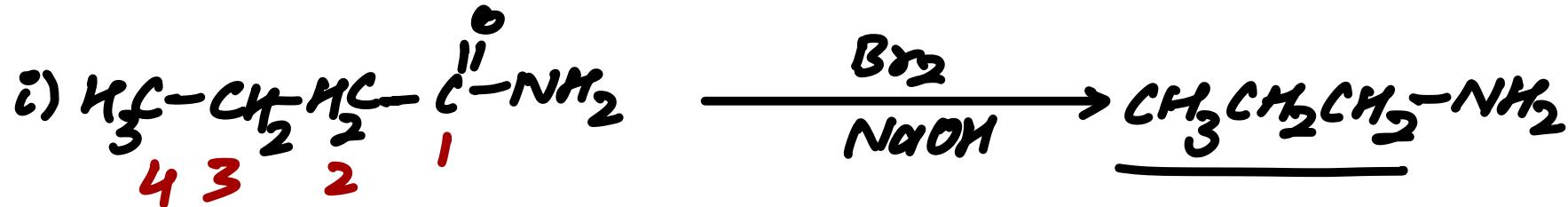
(i) the amide which gives propanamine by Hoffmann bromamide reaction.

(ii) the amine produced by the Hoffmann degradation of benzamide.

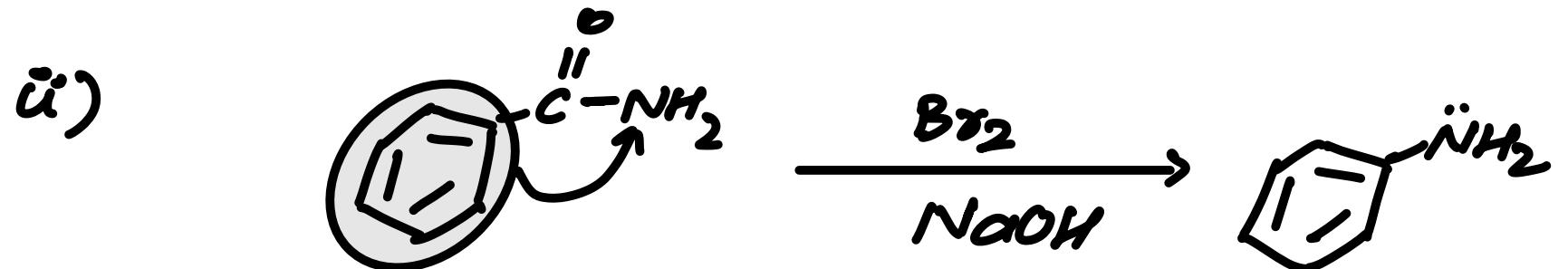


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Butanamide



Aniline.

Benzanamine

Intext Question

9.3 How will you convert

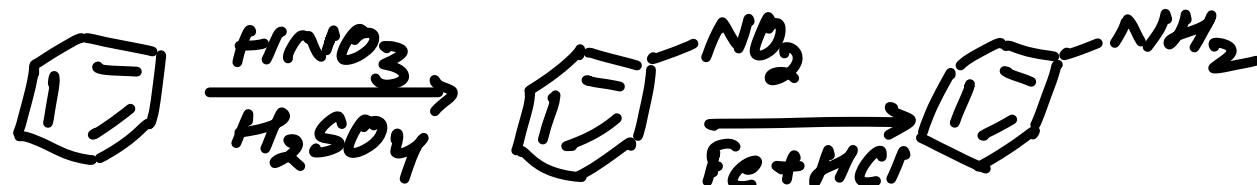
- Benzene into aniline
- Benzene into N, N-dimethylaniline
- $\text{Cl}-(\text{CH}_2)_4-\text{Cl}$  into hexan-1,6-diamine?



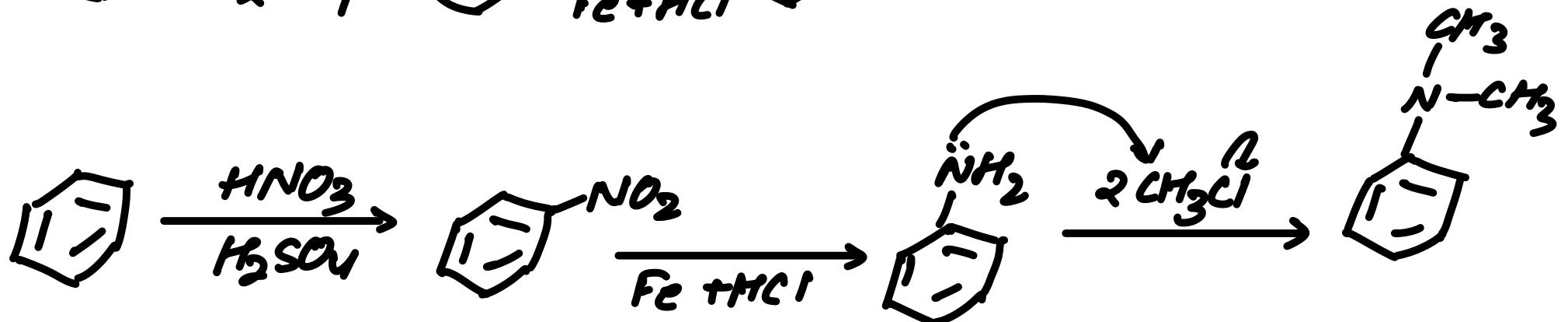
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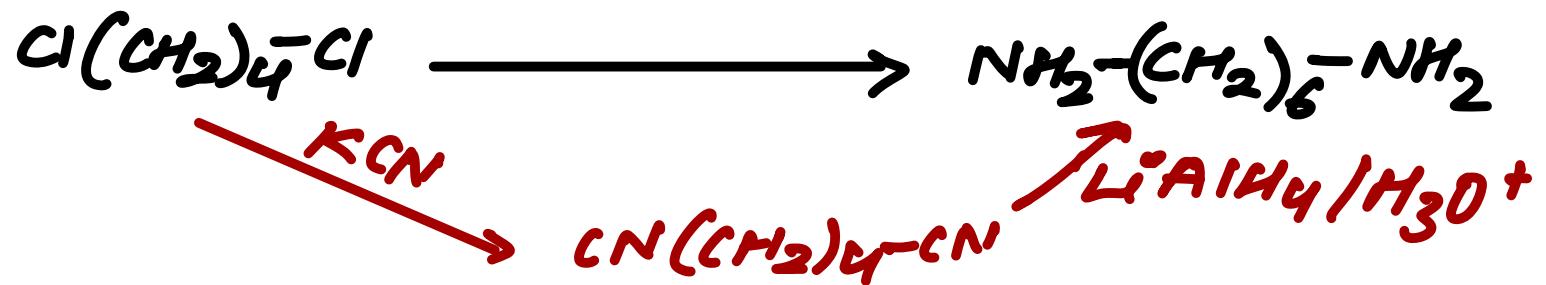
i)



ii)



iii)



The correct order of the basic strength of methyl substituted amines in aqueous solution is

- (a)  $(\text{CH}_3)_3\text{N} > \text{CH}_3\text{NH}_2 > (\text{CH}_3)_2\text{NH}$
- (b)  $(\text{CH}_3)_3\text{N} > (\text{CH}_3)_2\text{NH} > \text{CH}_3\text{NH}_2$
- (c)  $\text{CH}_3\text{NH}_2 > (\text{CH}_3)_2\text{NH} > (\text{CH}_3)_3\text{N}$
- (d)  ~~$(\text{CH}_3)_2\text{NH} > \text{CH}_3\text{NH}_2 > (\text{CH}_3)_3\text{N}$~~  (NEET 2019)

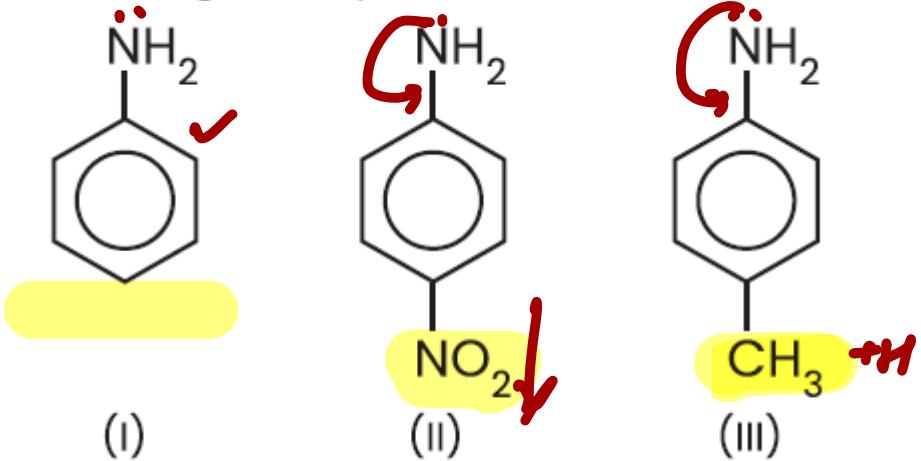
$2^\circ > 1^\circ > 3^\circ$



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The correct increasing order of basic strength for the following compounds is



III > II > I

- (a) II < III < I  
(b) III < I < II  
(c) III < II < I  
~~(d) II < I < III~~

(NEET 2017)

~~✓~~ The correct statement regarding the basicity of arylamines is

- (a) Arylamines are generally more basic than alkylamines because the nitrogen lone-pair electrons are not delocalized by interaction with the aromatic ring  $\pi$ -electron system ~~X~~
- (b) Arylamines are generally more basic than alkylamine because of aryl group ~~X~~
- (c) Arylamines are generally more basic than alkylamines, because the nitrogen atom in arylamines is sp-hybridized ~~X~~
- ~~✓~~ (d) Arylamines are generally less basic than alkylamines because the nitrogen lone-pair electrons are delocalized by interaction with the aromatic ring  $\pi$ -electron system. (NEET-I 2016)

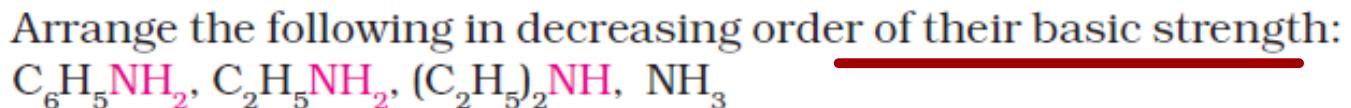


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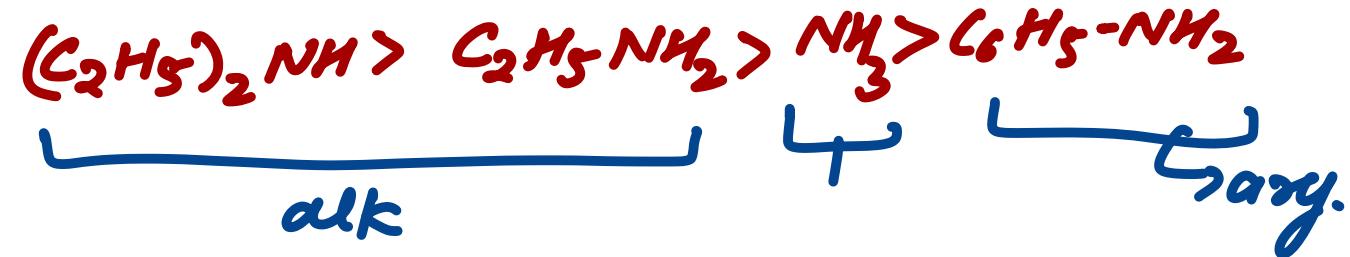
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### Example 9.4

Arrange the following in decreasing order of their basic strength:



Gar Gar  $\hookrightarrow_{2^0}$  ↳



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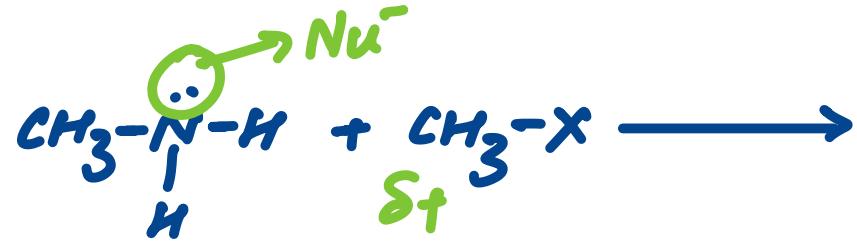
## 2. Alkylation

Amines undergo alkylation on reaction with alkyl halides (refer Unit 6, Class XII).



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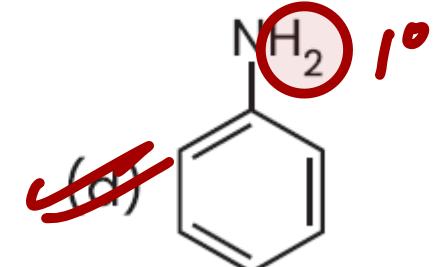
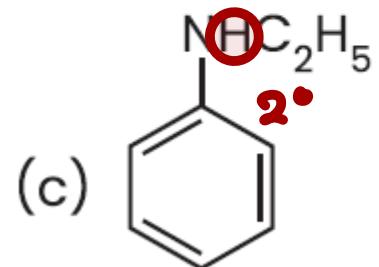
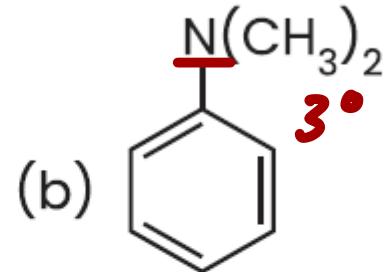
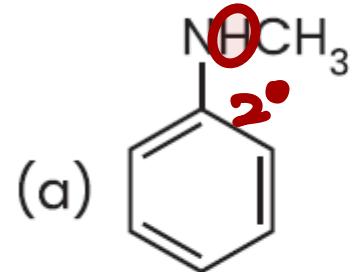
Which of the following amine will give the carbylamine test?  $\text{CHCl}_3 + \text{KOH}$ .

1° amine



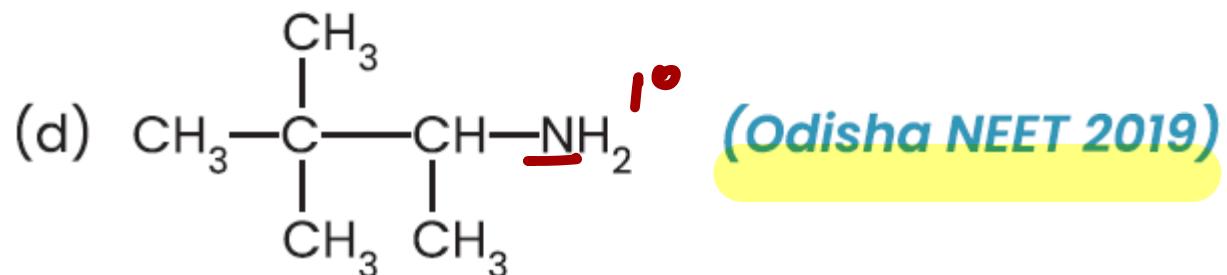
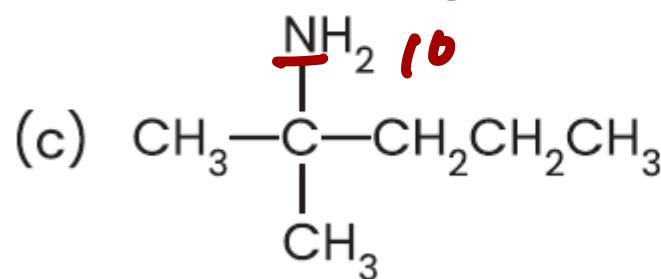
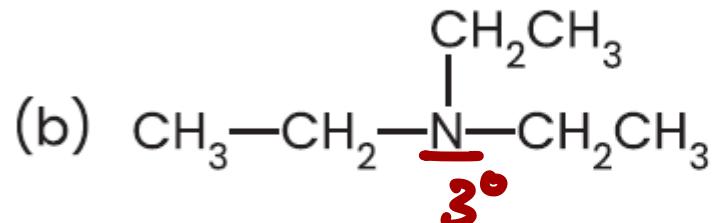
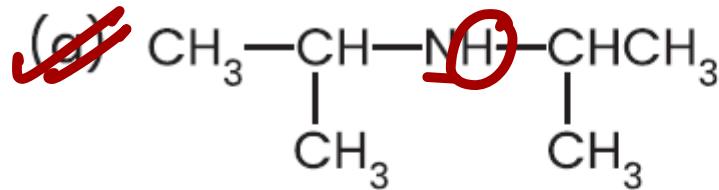
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(NEET 2020)

The amine that reacts with Hinsberg's reagent to give an alkali insoluble product is



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(Odisha NEET 2019)

Nitration of aniline in strong acidic medium also gives m-nitroaniline because  $\xrightarrow{\text{anilinium ion}}$

- (a) In absence of substituents nitro group always goes to m-position
- (b) In electrophilic substitution reactions amino group is meta directive
- (c) In spite of substituents nitro group always goes to only m-position
- (d) In acidic (strong) medium aniline is present as anilinium ion (NEET 2018)



Given below are two statements:

**Statement I:** Aniline does not undergo FriedelCrafts alkylation reaction.

**Statement II:** Aniline cannot be prepared through Gabriel synthesis.

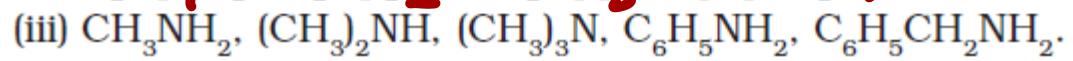
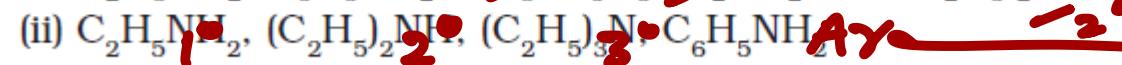
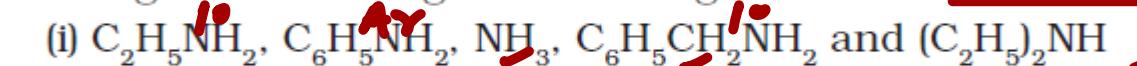
In the light of the above statements, choose the correct answer from the options given below:

- (1) Statement I is correct but Statement II is false.
- (2) Statement I is incorrect but Statement II is true.
- ~~(3)~~ Both Statement I and Statement II are true.
- (4) Both Statement I and Statement II are false.



## Intext Questions

9.4 Arrange the following in increasing order of their basic strength:



$1^\circ$        $2^\circ$        $3^\circ$       Ar

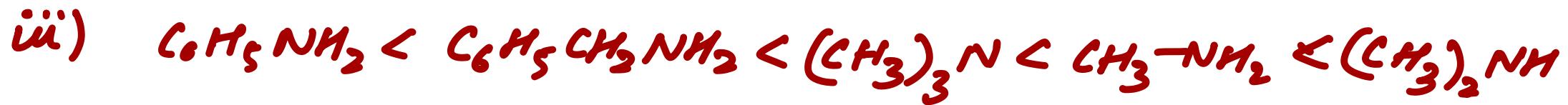
$\begin{cases} 1^\circ \\ 2^\circ \\ \text{Bulky} \end{cases}$

$\xrightarrow{Ar \rightarrow -2^\circ}$

$R \rightarrow C_2H_5$

$2^\circ > 3^\circ > 1^\circ$

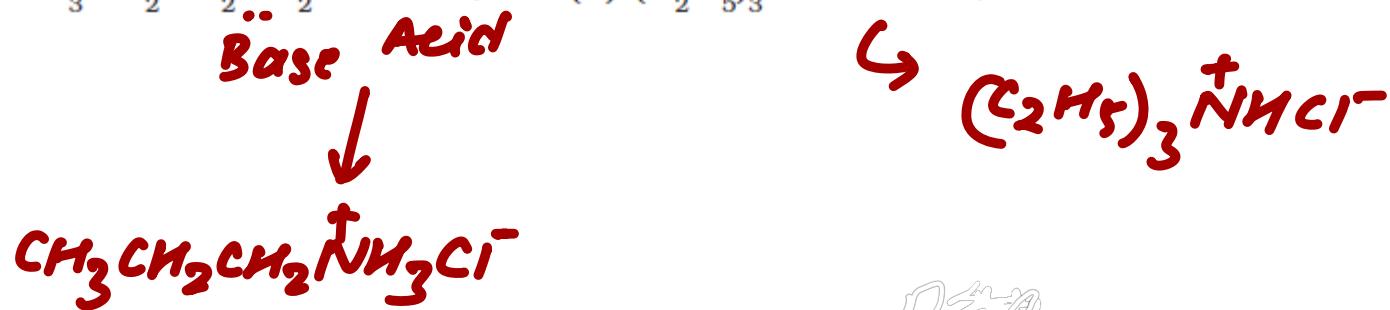
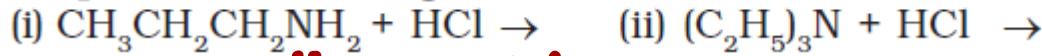
$R-CH_3 \rightarrow 2^\circ > 1^\circ > 3^\circ$



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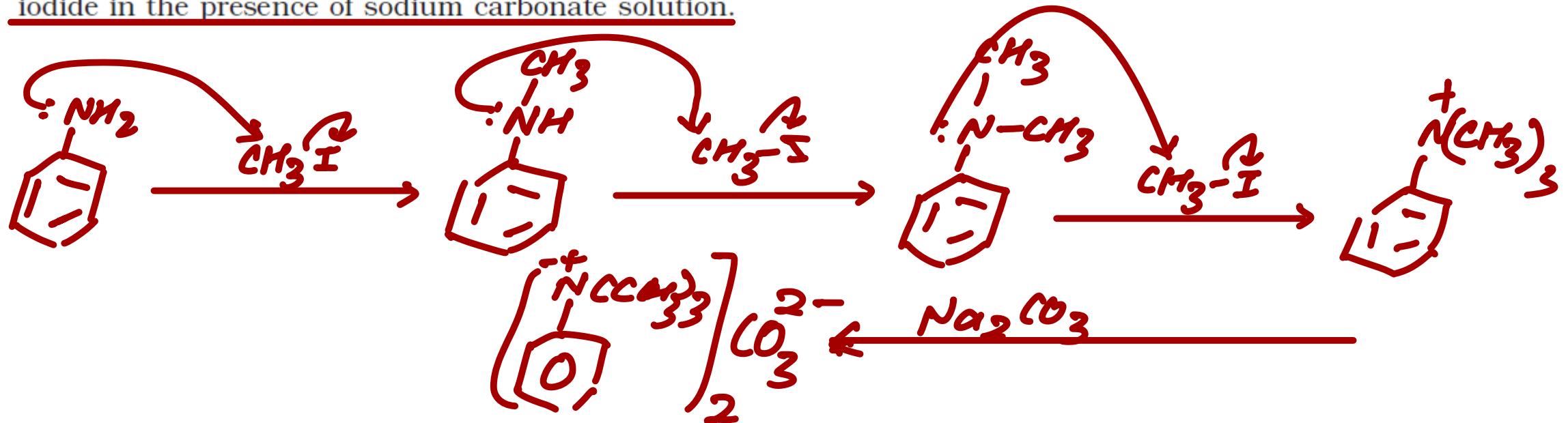
9.5 Complete the following acid-base reactions and name the products:



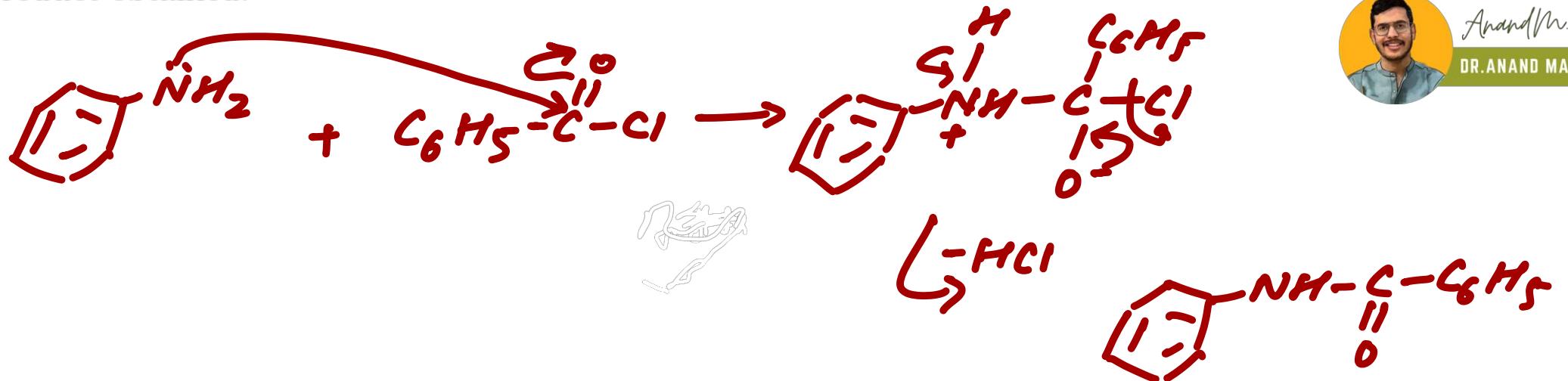
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9.6 Write reactions of the final alkylation product of aniline with excess of methyl iodide in the presence of sodium carbonate solution.



- 9.7 Write chemical reaction of aniline with benzoyl chloride and write the name of the product obtained.

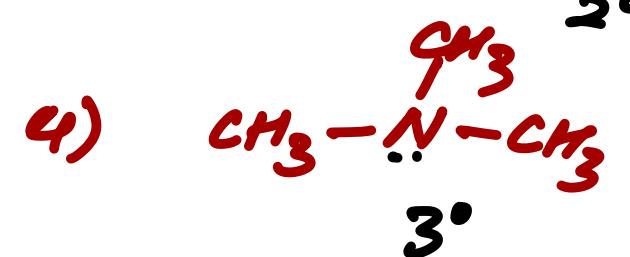
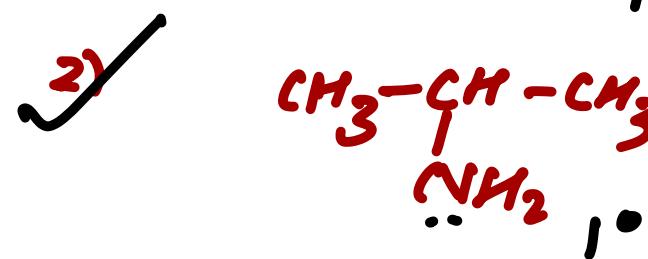


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- 9.8 Write structures of different isomers corresponding to the molecular formula,  $\text{C}_3\text{H}_9\text{N}$ . Write IUPAC names of the isomers which will liberate nitrogen gas on treatment with nitrous acid.

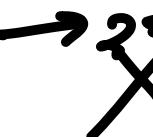
10



Given below are two statements

**Statement I:** Primary aliphatic amines react with  $\text{HNO}_2$  to give unstable diazonium salts. 

**Statement II:** Primary aromatic amines react with  $\text{HNO}_2$  to form diazonium salts which are stable even above 300 K. In the light of the above statements, choose the most appropriate answer from the options given below.

  $\rightarrow 293-298\text{ K.}$

-  (a) Statement I is correct but Statement II is incorrect.
- (b) Statement I is incorrect but Statement II is correct.
- (c) Both Statement I and Statement II are correct.
- (d) Both Statement I and Statement II are incorrect.

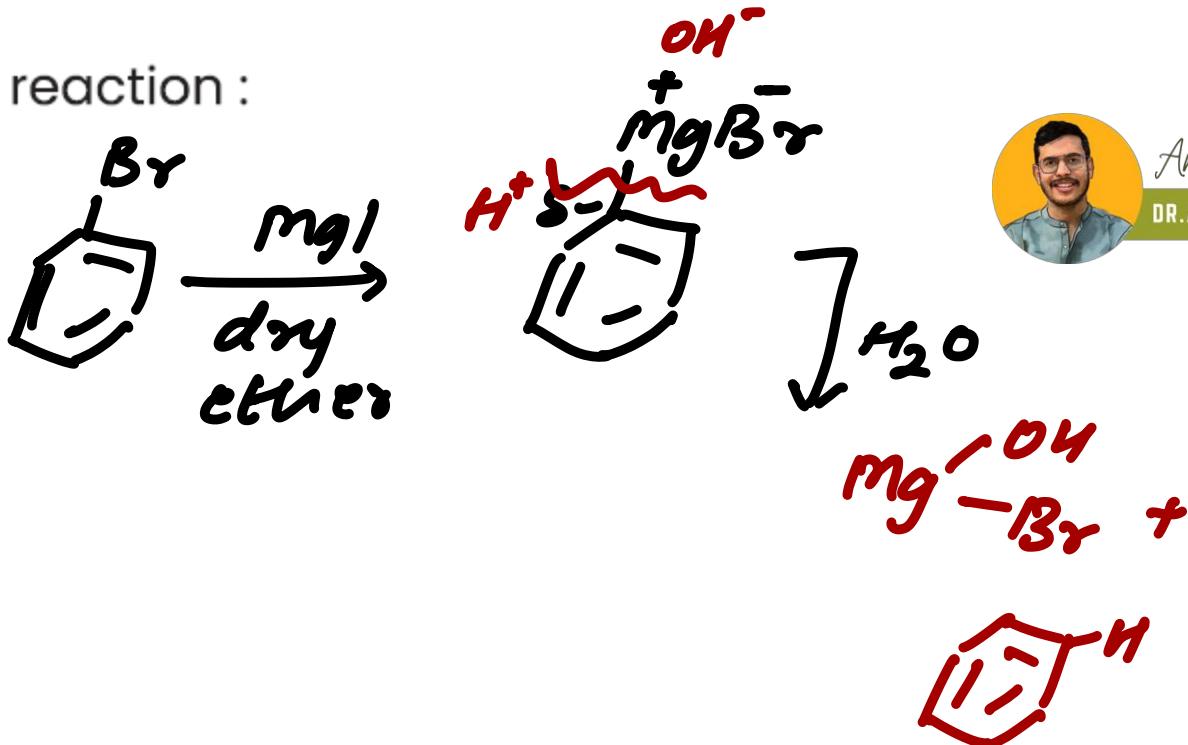
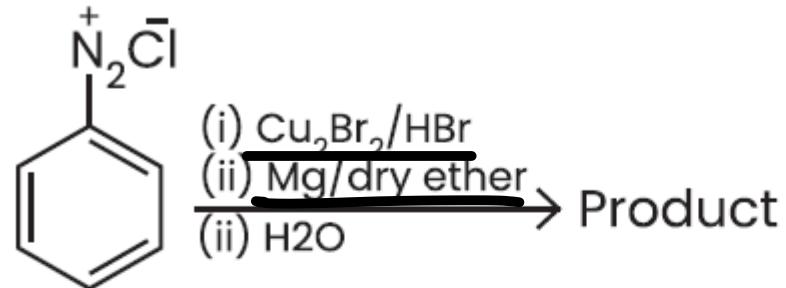
**(NEET 2022)**



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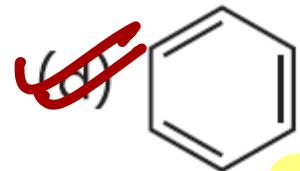
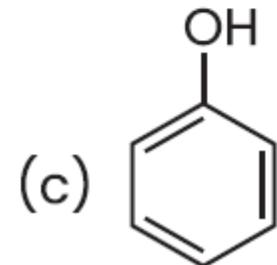
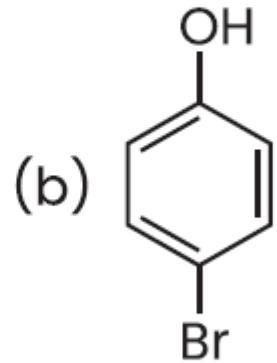
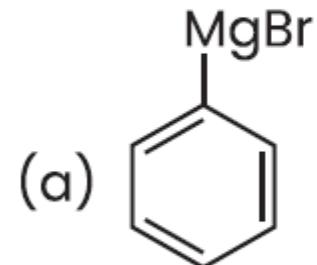
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Identify the product in the following reaction :



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(NEET 2023)

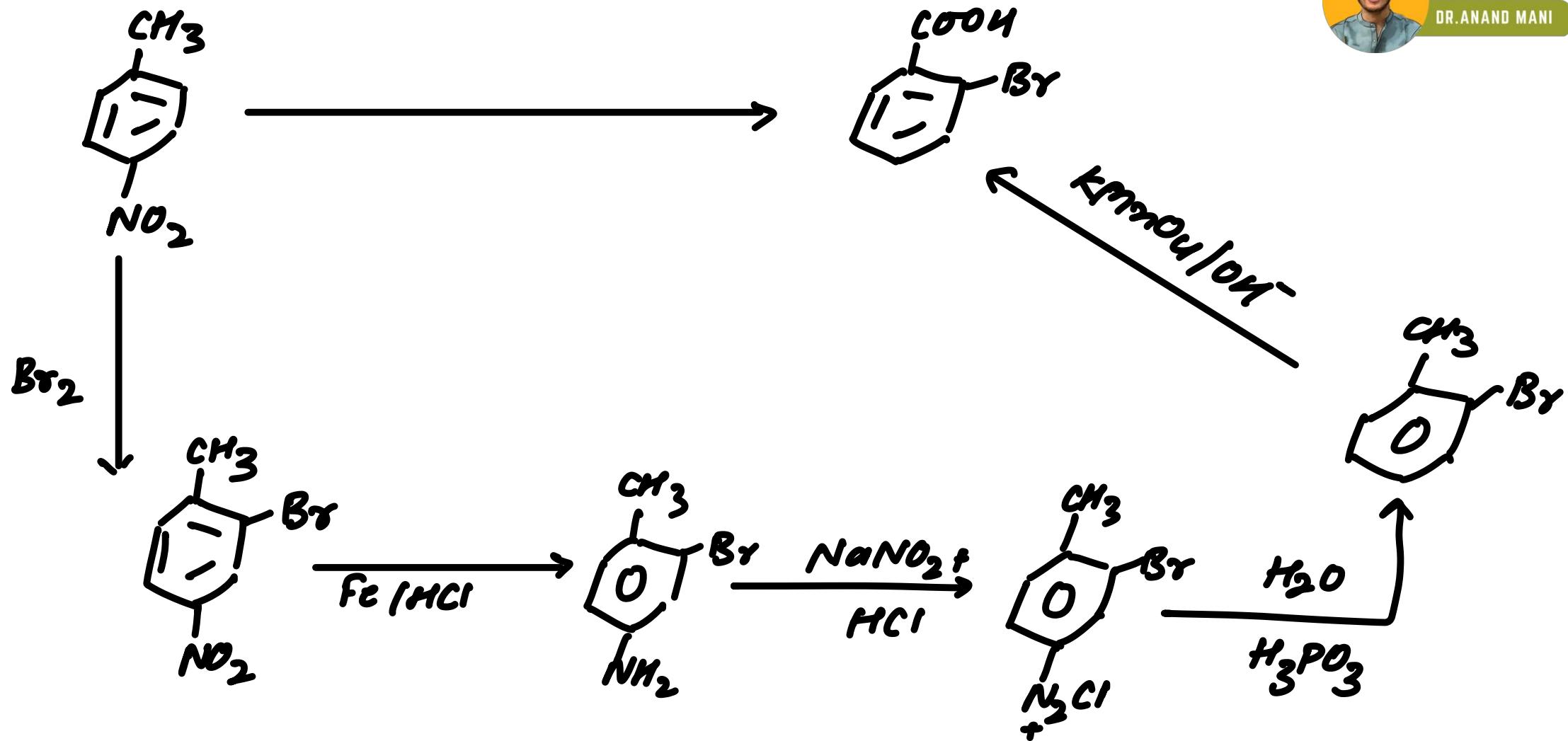
How will you convert 4-nitrotoluene to 2-bromobenzoic acid ?

Example 9.5



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Intext Question

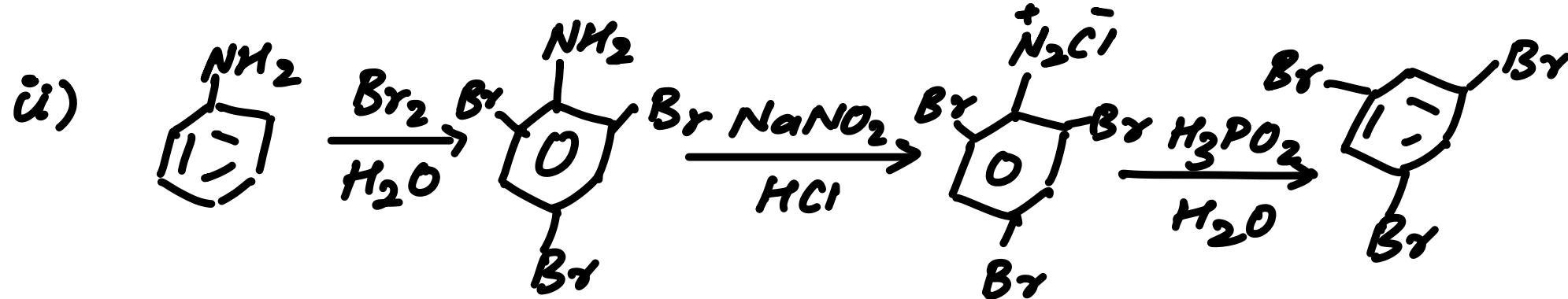
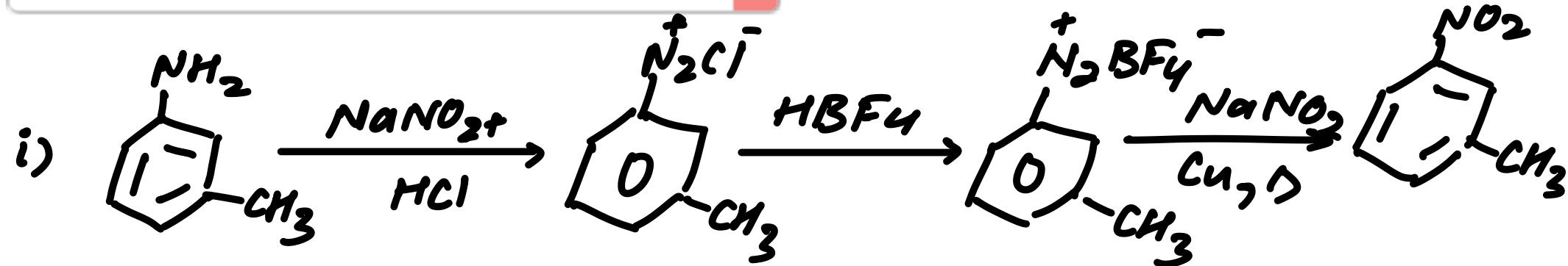
9.9 Convert

- 3-Methylaniline into 3-nitrotoluene.
- Aniline into 1,3,5 - tribromobenzene.



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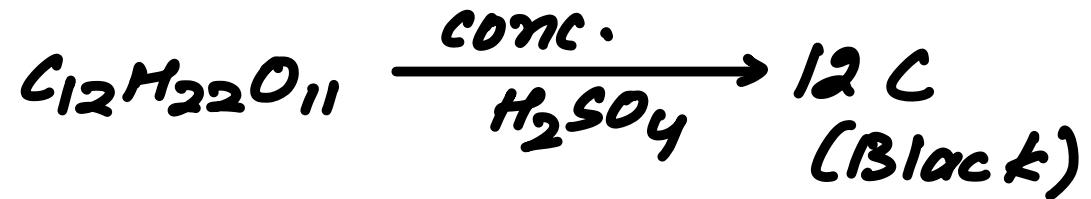
# BIOMOLECULES



The reaction of concentrated sulphuric acid with carbohydrates  $C_{12}H_{22}O_{11}$  is an example of

- dehydration      (b) oxidation  
(c) reduction      (d) sulphonation

(NEET 2020)



**NOT**

Which of the following statements is not true about glucose?

- (a) It is an aldohexose.
- (b) It contains five hydroxyl groups.  $\rightarrow \text{OH}$
- (c) It is a reducing sugar.
- (d) It is an aldopentose.

(NEET 2020)

$5x \rightarrow 6$



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The difference between amylose and amylopectin is

- (a) amylopectin have  $1 \rightarrow 4\alpha$ -linkage and  $1 \rightarrow 6\beta$ -linkage ~~X~~
- (b) amylose have  $1 \rightarrow 4\alpha$ -linkage and  $1 \rightarrow 6\beta$ -linkage ~~X~~
- ~~(c) amylopectin have  $1 \rightarrow 4\alpha$ -linkage and  $1 \rightarrow 6\alpha$ -linkage~~
- (d) amylose is made up of glucose and galactose ~~X~~  $\alpha_1-\alpha_4$



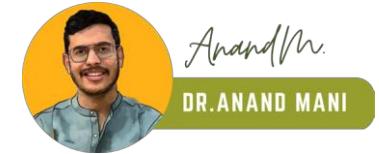
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(NEET 2018)

## Intext Questions

- 10.1 Glucose or sucrose are soluble in water but cyclohexane or benzene (simple six membered ring compounds) are insoluble in water. Explain.



→ Hydroxyl group → Hydrogen Bonding ↑ & Solubility

## 10.2 What are the expected products of hydrolysis of lactose?

glucose

galactose



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10.3 How do you explain the absence of aldehyde group in the pentaacetate of D-glucose?

↳ when reacts with  $\text{NH}_2\text{OH}$

↳ it does not form oxime.



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The non-essential amino acid among the following is

- (a) leucine
- ~~(b)~~ alanine
- (c) lysine
- (d) valine

(NEET 2019)

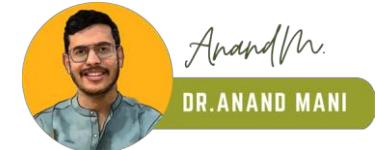


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Which of the following is a basic amino acid?

- (a) Alanine
- (b) Tyrosine ~~x~~  $\text{GAG} > \text{CAG}$
- (c) ~~Lysine~~
- (d) Serine



(NEET 2020)

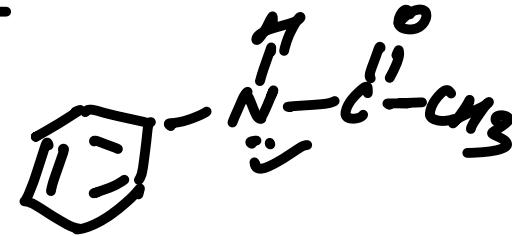
Which of the following compounds can form a Zwitter ion?

(a) Benzoic acid

(c) Aniline

(b) Acetanilide

~~(d)~~ Glycine



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(NEET 2018)



### Intext Questions

- 10.4 The ~~melting~~ points and solubility in water of amino acids are generally higher than that of the corresponding halo acids. Explain.

exists as zwitter ion  
dipolar behaviour  
+  
salt.



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10.5 Where does the water present in the egg go after boiling the egg?

Absorbed by coagulated protein through H-bonding.



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**Statement I:** A unit formed by the attachment of a base to 1' position of sugar is known as nucleoside.

**Statement II :** When nucleoside is linked to phosphorous acid at 5'-position of sugar moiety, we get nucleotide. In the light of the above statements, choose the correct answer from the options given below :

- (a) Statement I is true but Statement II is false
- (b) Statement I is false but Statement II is true
- ~~(c) Both Statement I and Statement II are true~~
- (d) Both Statement I and Statement II are false

**(NEET 2023)**



The correct statement regarding RNA and DNA, respectively is

- (a) The sugar component in RNA is ribose and the sugar component in DNA is 2'-deoxyribose
- (b) The sugar component in RNA is arabinose and the sugar component in DNA is ribose
- (c) The sugar component in RNA is 2'-deoxyribose and the sugar component in DNA is arabinose
- (d) The sugar component in RNA is arabinose and the sugar component in DNA is 2'-deoxyribose



(NEET-I 2016)

## Intext Questions

10.6 Why cannot vitamin C be stored in our body?

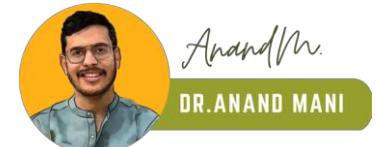
↳ water soluble  
↳ urine pass.



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10.7 What products would be formed when a nucleotide from DNA containing thymine is hydrolysed?



pentose + phosphate + Nit. base  
Sugar Group base  
thymine.

- 10.8 When RNA is hydrolysed, there is no relationship among the quantities of different bases obtained. What does this fact suggest about the structure of RNA?



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Single stranded

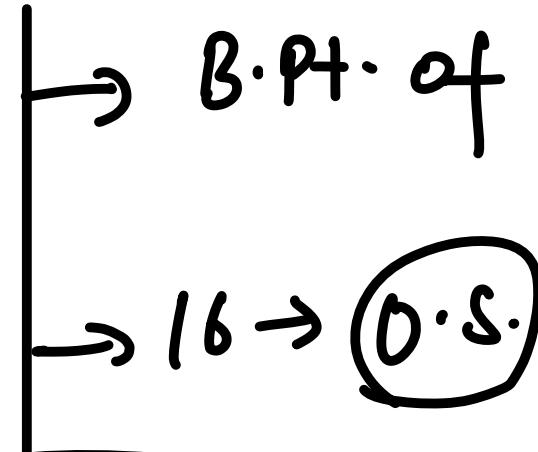
# THE p-BLOCK ELEMENTS



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\* 2 Q



Group 15

B.Pt. of Hydrides of Group 16.

\* Marking.  
\* PDF.

# p-BLOCK ELEMENTS - PART 1



## New Syllabus:

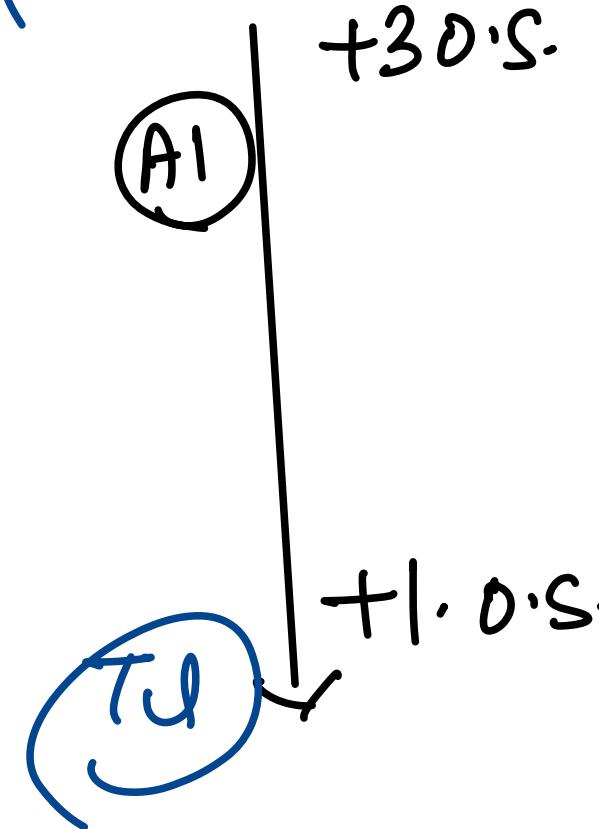
- 1. Electronic Configuration.
- 2. General Trends in Physical Properties of Elements.
- 3. General Trends in Chemical Properties of Elements.
- 4. Unique Behaviour of the First Element In Each Group.

Q1. Taking stability as the factor, which one of the following represents correct relationship?



(NEET 2023)

- +1      +3
- (a)  $\text{AlCl} > \text{AlCl}_3$   $\times$
- (b)  $\text{TlI} > \text{TlI}_3$
- (c)  $\text{TlCl}_3 > \text{TlCl}$   $\times$
- (d)  $\text{InI}_3 > \text{InI}$



Q2. Which one of the following elements is unable to form  $MF_6^{3-}$  ion?

- 
- (NEET 2018)**
- (a) B
  - (b) Al
  - (c) Ga
  - (d) In



Match the following.

Which of the following is correct option?



**(NEET 2020)**

Oxide	Nature
A. CO	(i) Basic
B. BaO	(ii) Neutral
C. Al <sub>2</sub> O <sub>3</sub>	(iii) Acidic
D. Cl <sub>2</sub> O <sub>7</sub>	(iv) Amphoteric

- (a) A-(ii), B-(i), C-(iv), D-(iii)
- (b) A-(iii), B- (iv), C-(i), D-(ii)
- (c) A-(iv), B-(iii), C-(ii), D-(i)
- (d) A-(i), B-(ii), C-(iii), D-(iv)

In which one of the following arrangements the given sequence is not strictly according to the properties indicated against it?



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(NEET 2021)

(a) HF < HCl < HBr < HI : Increasing acidic strength ✓

(b)  $\text{H}_2\text{O} < \text{H}_2\text{S} < \text{H}_2\text{Se} < \text{H}_2\text{Te}$  : Increasing  $\text{pK}_a$  values ✗

decreasing  $\text{K}_a$ , acidic

(c)  $\text{NH}_3 < \text{PH}_3 < \text{AsH}_3 < \text{SbH}_3$  : Increasing acidic character ✓

(d)  $\text{CO}_2 < \text{SiO}_2 < \text{SnO}_2 < \text{PbO}_2$  : Increasing oxidising power ✓



$\text{Pb}^{2+}$

## Oxides:-

## O.S. & acidity.



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Among the following, the correct order of acidity is

+1    +3    +5    +7

(NEET-I 2016, AIPMT 2005)

- (a)  $\text{HClO} < \text{HClO}_2 < \text{HClO}_3 < \text{HClO}_4$
- (b)  $\text{HClO}_2 < \text{HClO} < \text{HClO}_3 < \text{HClO}_4$
- (c)  $\text{HClO}_4 < \text{HClO}_2 < \text{HClO} < \text{HClO}_3$
- (d)  $\text{HClO}_3 < \text{HClO}_4 < \text{HClO}_2 < \text{HClO}$

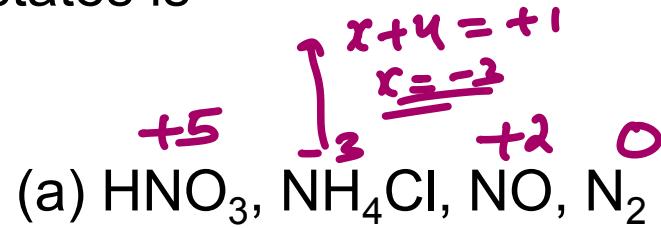
Which of the following statement is NOT correct about diborane?

**(NEET 2022)**

- (a) The four terminal Hydrogen atoms and the two Boron atoms lie in one plane.
- (b) Both the Boron atoms are  $sp^2$  hybridised. X
- (c) There are two 3-centre-2-electron bonds. ✓
- (d) The four terminal B-H bonds are two centre two electron bonds. ✓



The correct order of N-compounds in its decreasing order of oxidation states is



(NEET 2018)

- (a)  $\text{HNO}_3, \text{NH}_4\text{Cl}, \text{NO}, \text{N}_2$
- (b)  $\text{HNO}_3$ ,  $\text{NO}$ ,  $\text{NH}_4\text{Cl}$ ,  $\text{N}_2$
- (c)  $\text{HNO}_3$ ,  $\text{NO}$ ,  $\text{N}_2$ ,  $\text{NH}_4\text{Cl}$
- (d)  $\text{NH}_4\text{Cl}, \text{N}_2, \text{NO}, \text{HNO}_3$

# What is the formula of laughing gas?



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- (a)  $\text{NO}_2$
  - (b)  $\text{NO}$
  - (c)  $\text{N}_2\text{O}$
  - (d)  $\text{N}_2\text{O}_5$

Nitrous oxide.

**Statement I:** The boiling points of the following hydrides of group 16 elements increases in the order  $\text{H}_2\text{O} < \text{H}_2\text{S} < \text{S}_2\text{Se} < \text{H}_2\text{Te}$ .

**Statement II:** The boiling points of these hydrides increase with increase in molar mass.



(NEET 2022)

- (a) Statement I is correct but Statement II is incorrect
- (b) Statement I is incorrect but Statement II is correct
- (c) Both Statement I and Statement II are correct
- (d) Both Statement I and Statement II are incorrect



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Which is the correct thermal stability order for  $H_2E$  (E = O, S, Se, Te and Po)?

(NEET 2019)

- (a)  $H_2O < H_2S < H_2Se < H_2Te < H_2Po$
- (b)  $H_2Po < H_2Te < H_2Se < H_2S < H_2O$
- (c)  $H_2Se < H_2Te < H_2Po < H_2O < H_2S$
- (d)  $H_2S < H_2O < H_2Se < H_2Te < H_2Po$

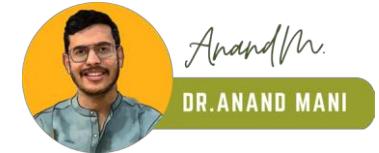
Which one of the following orders is correct for the bond dissociation enthalpy of halogen molecules?



(NEET-I 2016)

- (a)  $\text{Cl}_2 > \text{Br}_2 > \text{F}_2 > \text{I}_2$
- (b)  $\text{Br}_2 > \text{I}_2 > \text{F}_2 > \text{Cl}_2$
- (c)  $\text{F}_2 > \text{Cl}_2 > \text{Br}_2 > \text{I}_2$
- (d)  $\text{I}_2 > \text{Br}_2 > \text{Cl}_2 > \text{F}_2$

Which of the following statements is not true for halogens?



(NEET 2018)

- (a) All but fluorine show positive oxidation states ✓
- (b) All are oxidising agents ✓
- (c) All form monobasic oxyacids
- (d) Chlorine has the highest electron-gain enthalpy ✓

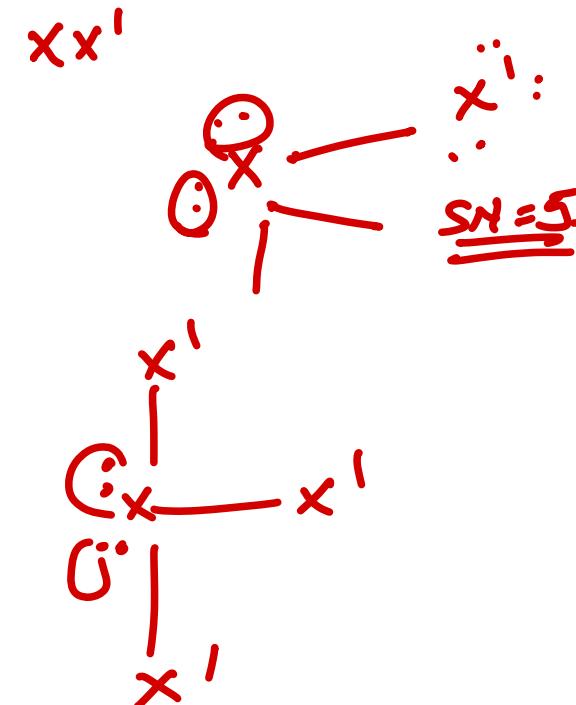
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Match the interhalogen compounds of Column I with the geometry in Column II and assign the correct code.

Column I	Column II
$XX'$	(i) T-shape
$XX'_3$	(ii) Pentagonal bipyramidal
$XX'_5$	(iii) Linear
$XX'_7$	(iv) Square-pyramidal
	(v) Tetrahedral

- (a) ~~A-(iii), B-(iv), C-(i), D-(ii)~~
- (b) **A-(iii), B-(i), C-(iv), D-(ii)**
- (c) ~~A-(v), B-(iv), C-(iii), D-(ii)~~
- (d) ~~A-(iv), B-(iii), C-(ii), D-(i)~~

(NEET 2017)



Match the compounds of Xe in column I with the molecular structure in column II.



- (a) A-ii, B-I, C-iii, D-iv
- (b) A-ii, B-iv, C-iii, D-i
- (c) A-ii, B-iii, C-I, D-iv
- (d) A-ii, B-I, C-iv, D-iii

Column I	Column II
A. <u>XeF<sub>2</sub></u>	(i) Square planar
B. <u>XeF<sub>4</sub></u>	(ii) Linear
C. XeO <sub>3</sub>	(iii) Square pyramidal
D. XeOF <sub>4</sub>	(iv) Pyramidal

