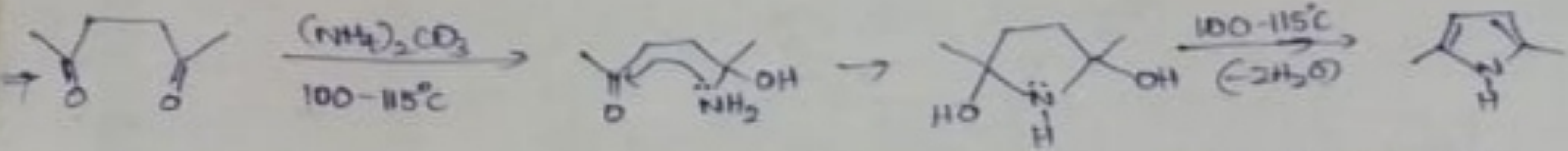
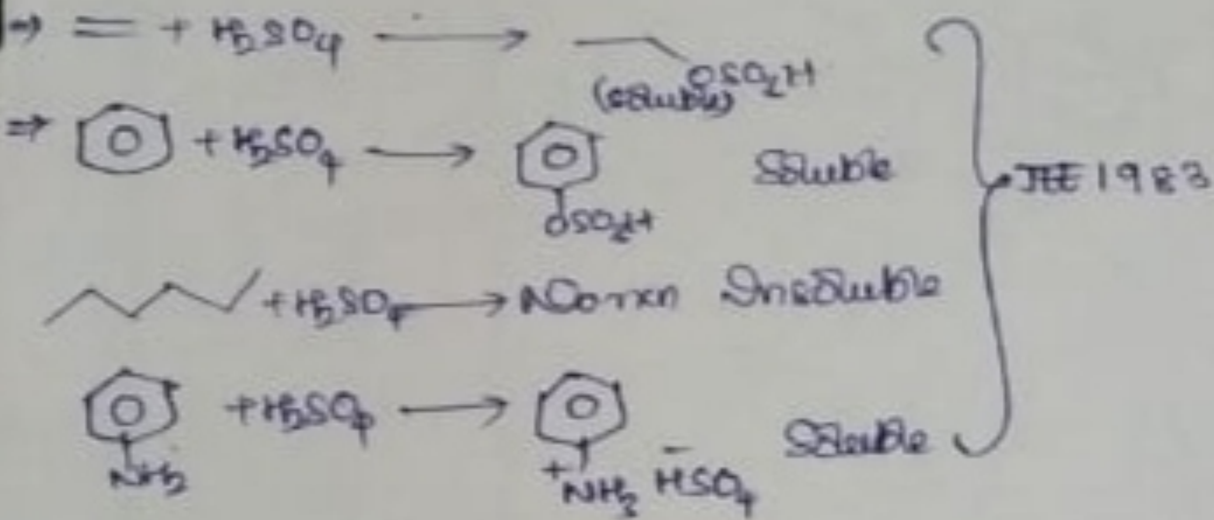
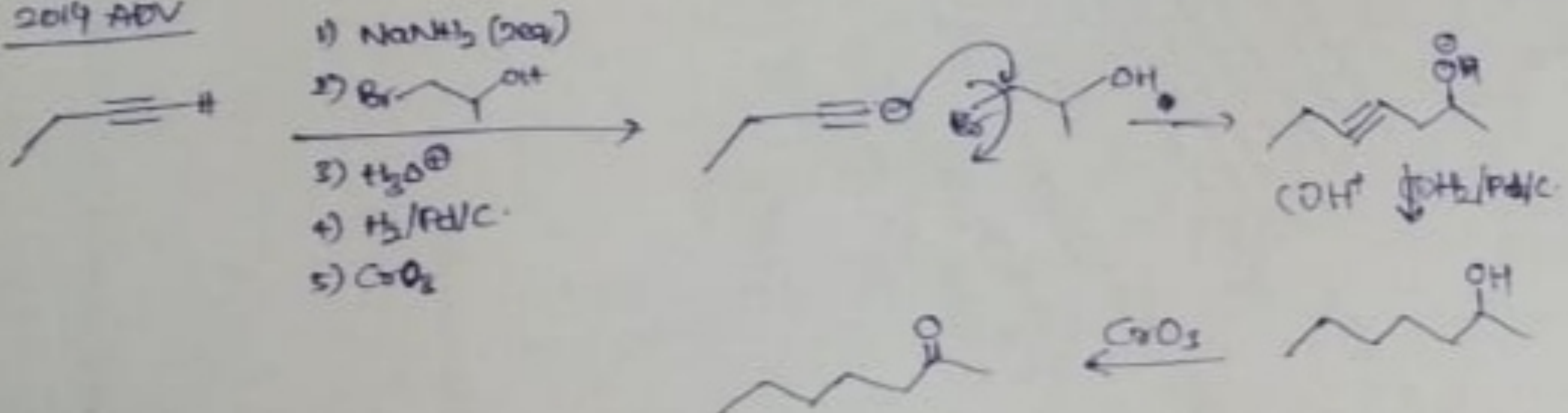
2018 ADV



→ C–C single bond energy is approximately 100 kcal/mol. [2010 JEE]

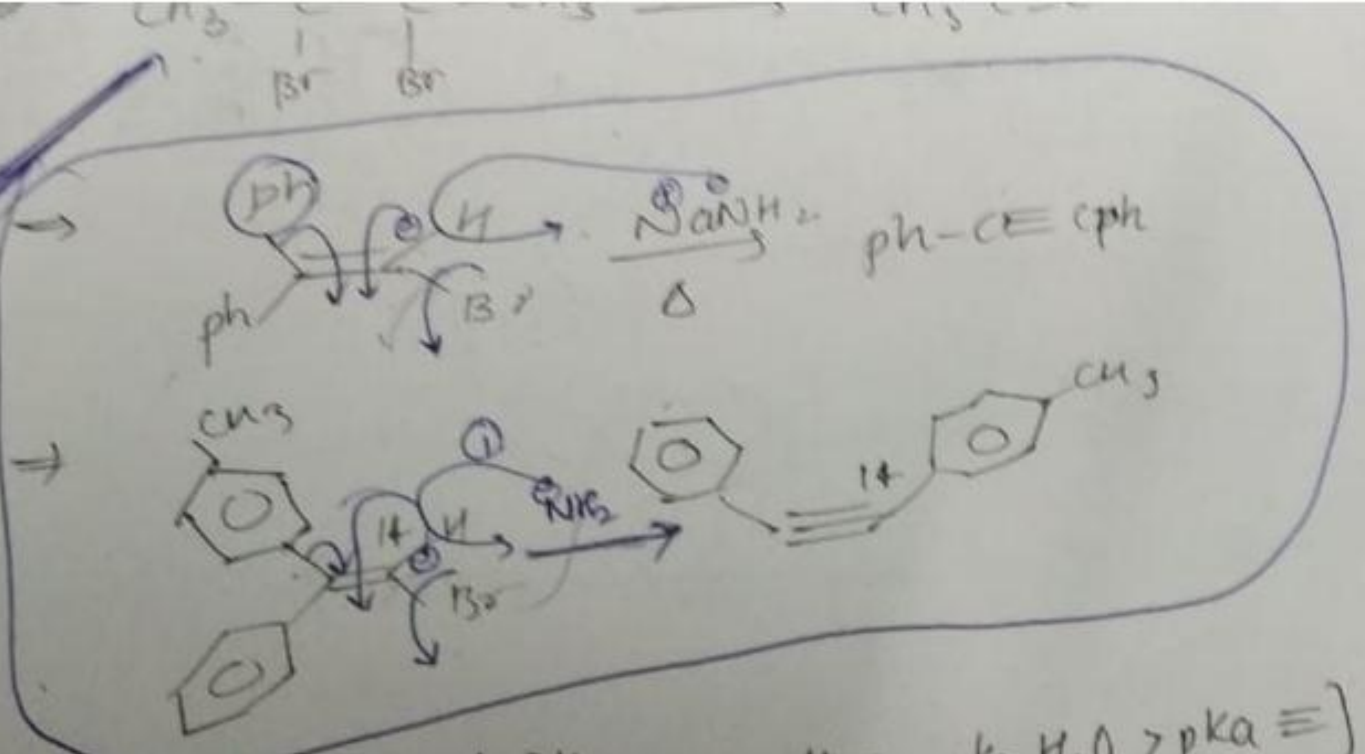


2019 ADV



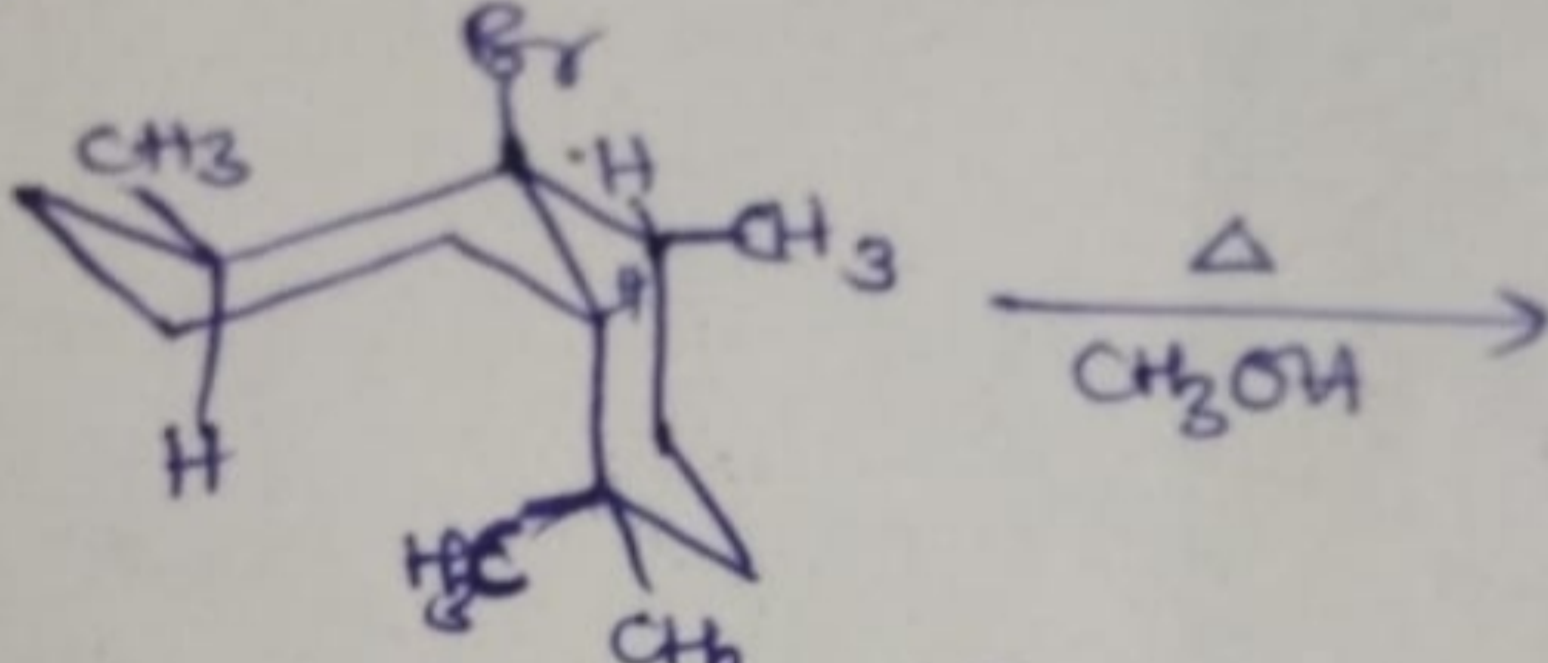
Mech:
DPP (21/05/2019).

Anti
Group
Migration.
vinyl $C^{\ominus}$ intermediate



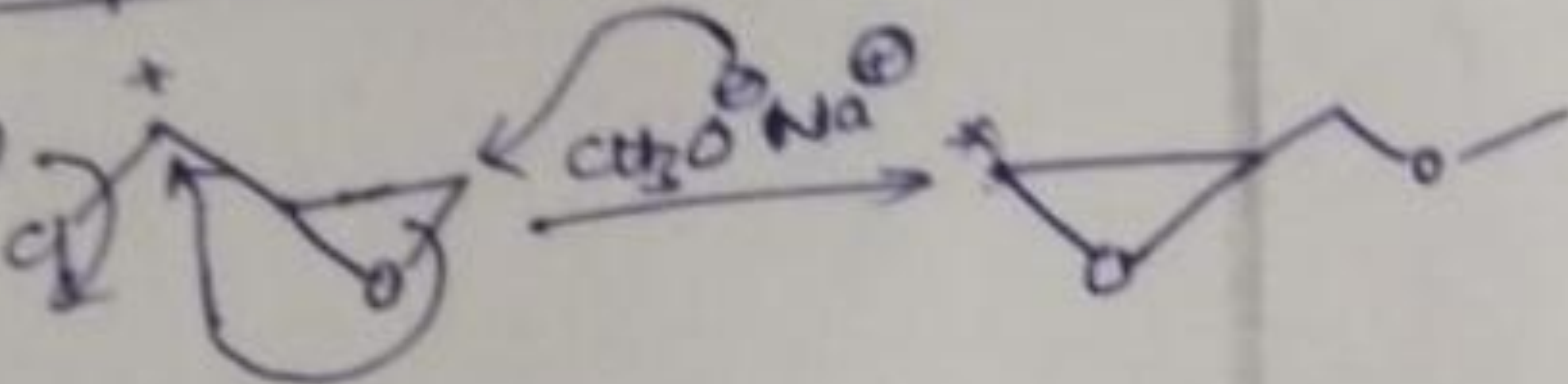
$H_2O > pKa \equiv$)

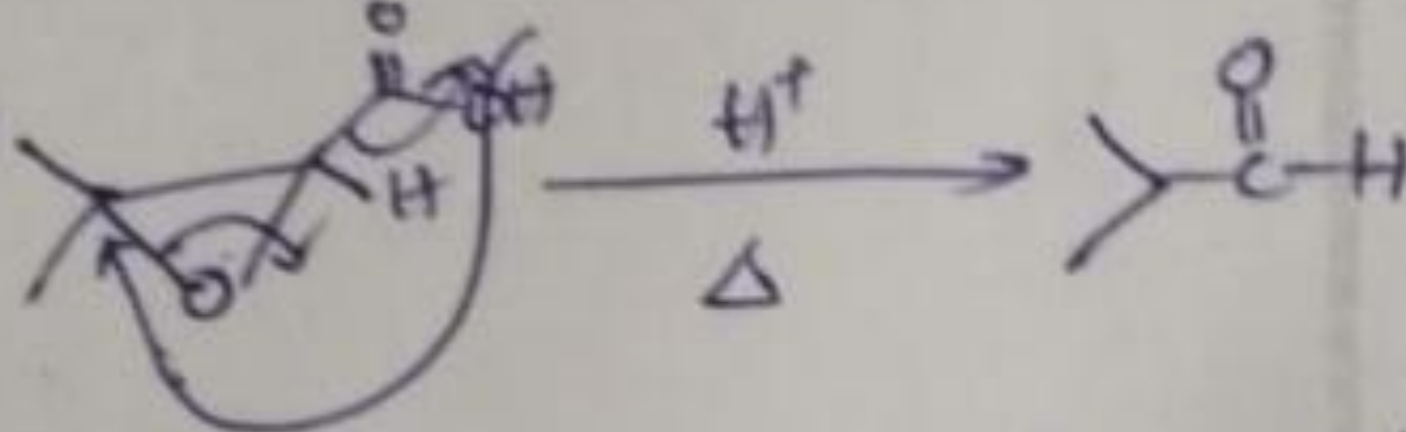
NOTE:



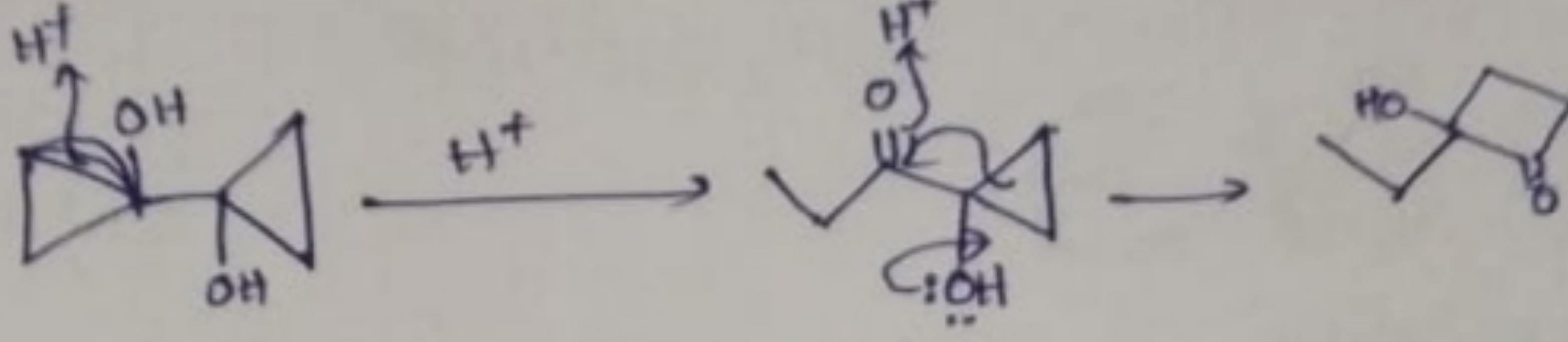
As it is heated in MeOH, ionisation takes place to form $C^{\oplus}$. Then there are 3 β-H which form alkene.

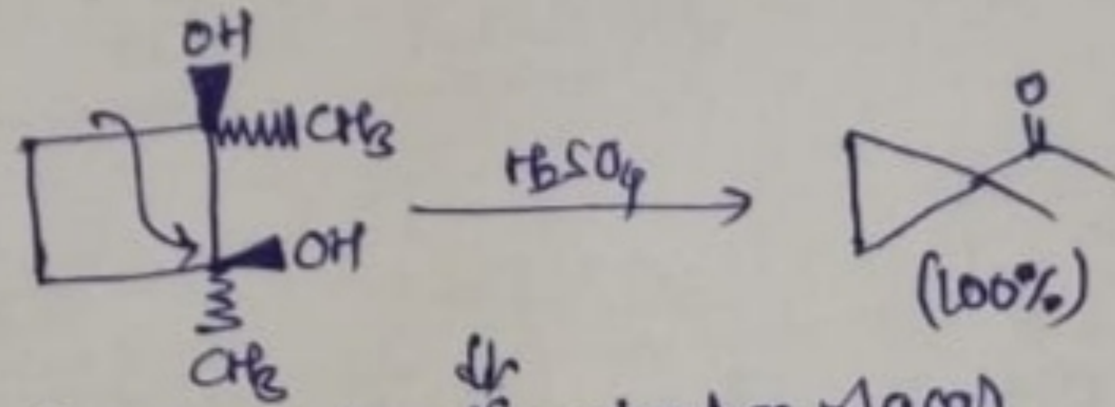
Propose Mech:

(1)


(2)


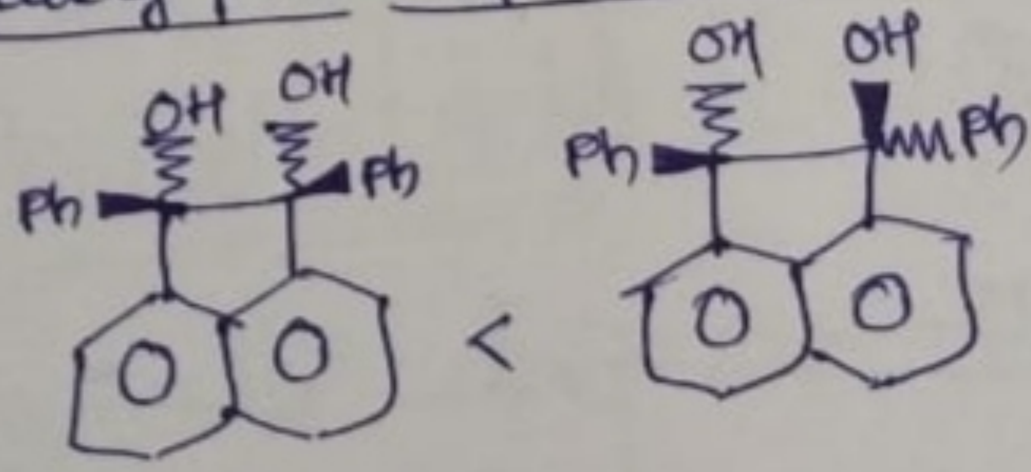
→ During cleavage of epoxide in basic medium, if any LG is there $-O^{\ominus}$ attacks & forms ring again

(xi) 

(xii) 

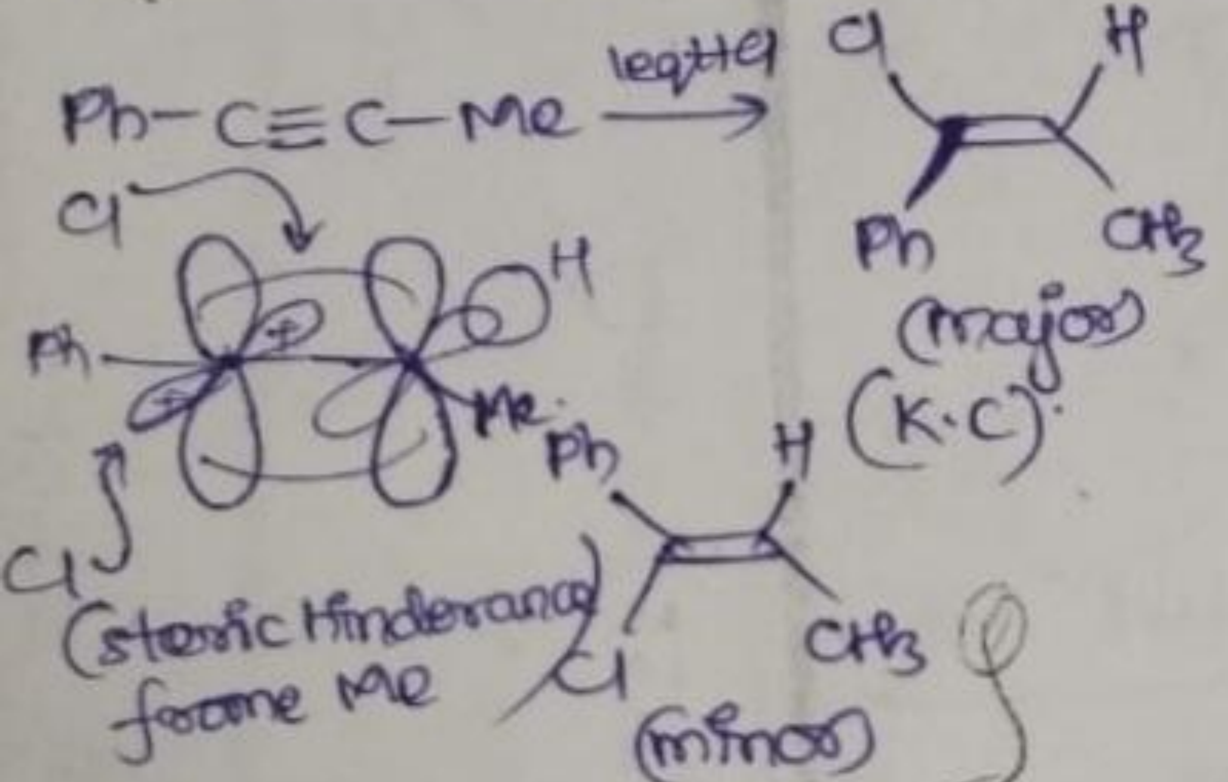
(Ring contraction takes place)

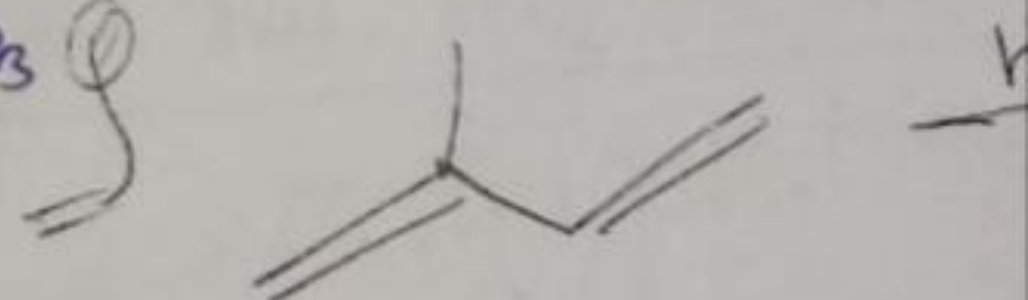
<u>Rate of pinacol spinacolone</u>



(Then Given in all Std Books).

$\boxed{\text{2020 – IIT}}$

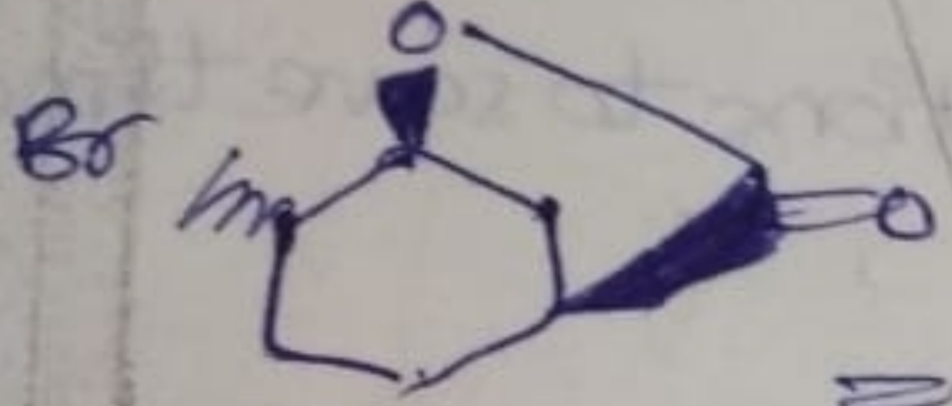




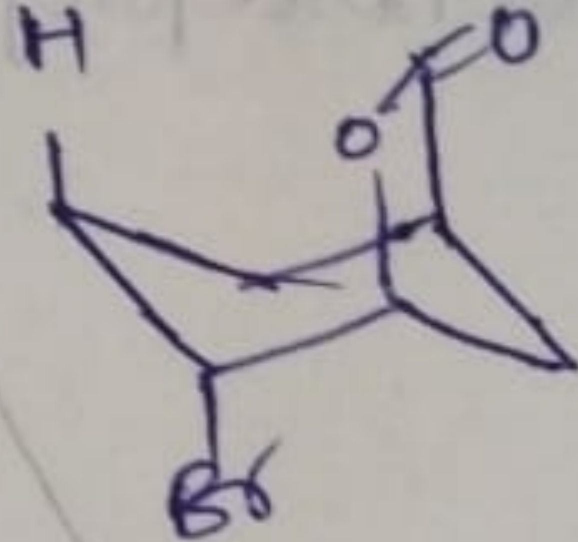
(T-S)

(more stable & major when HCl is in excess).

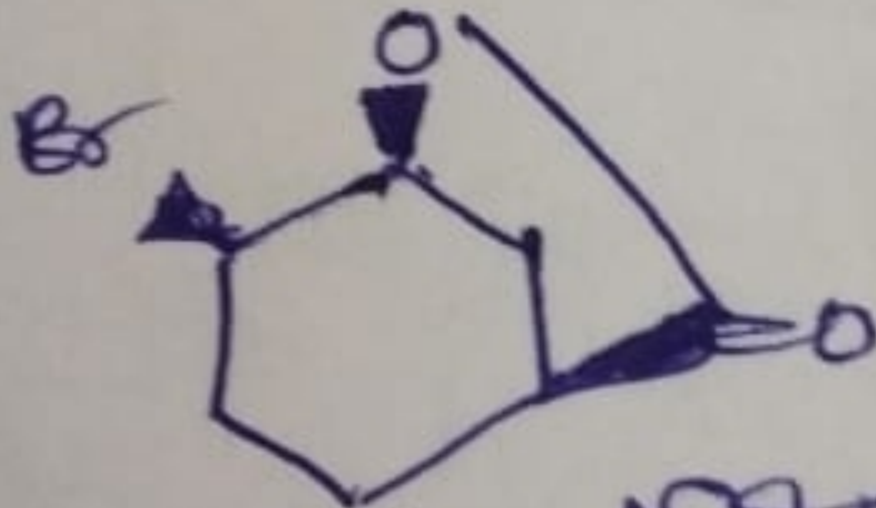
Br



=

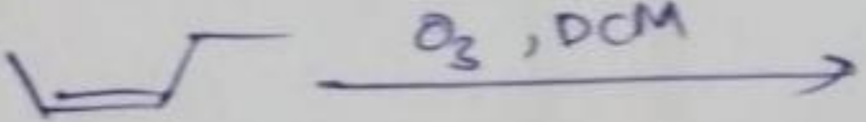


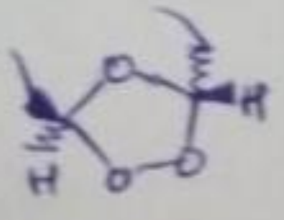
Antielimination occurs



Not possible

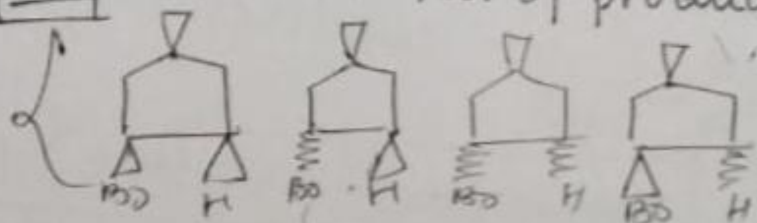
Q: Products formed





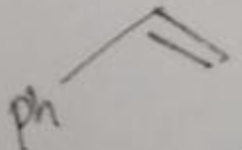
Q

$\xrightarrow{HBr}$ No. of products. (4)

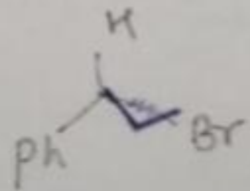


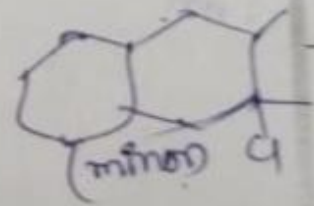
} 4 products.

Q

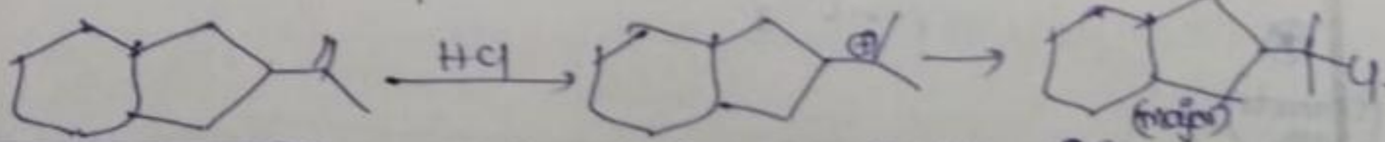


$\xrightarrow[ROOR]{HBr}$





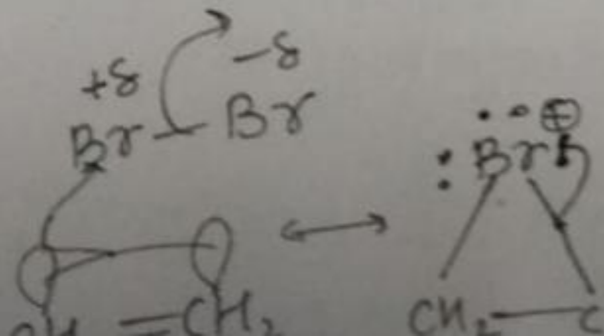
2019 MAINS
12-Jan-S-II . Q



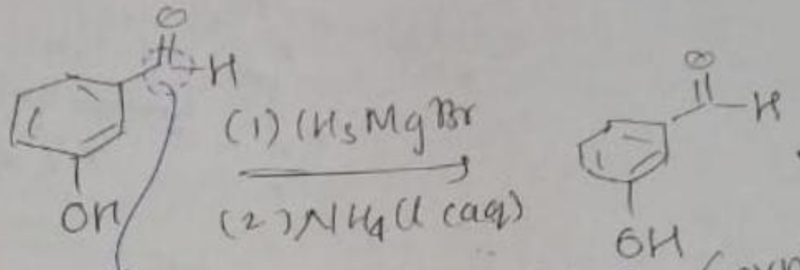
Not much ring expansion bcoz $C^{\oplus}$ is 3°

Addition of X_2

$=$ $\xrightarrow[\substack{CCl_4 \\ (or) \\ CS_2}]{Br_2}$

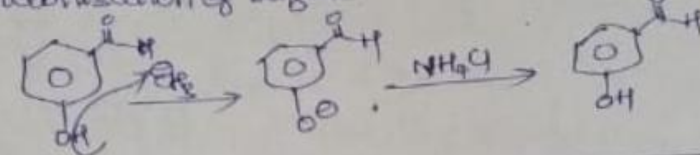


Q(4) =

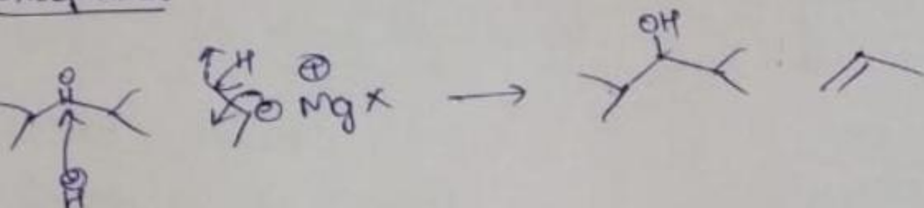


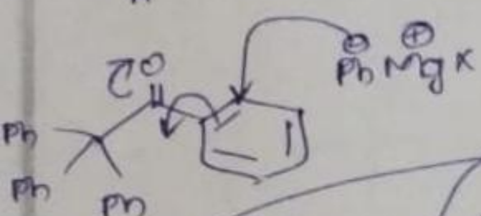
Explanation: This is not enough electrophilic bcoz of resonance stabilisation of benzene. (explain

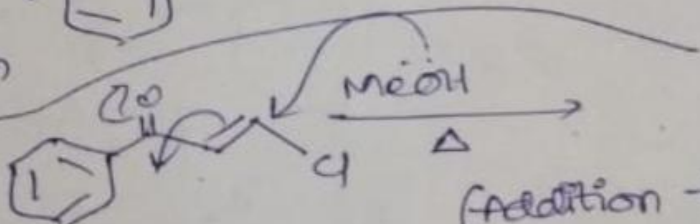
Q5



Exceptions:





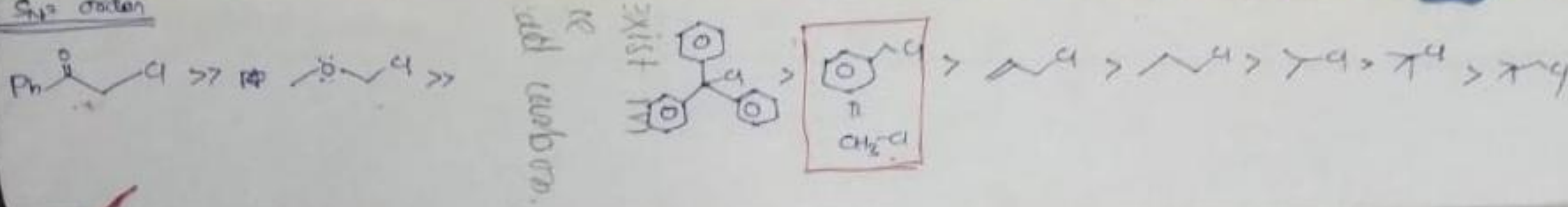


(Addition -Elimination)

During cleavage of Epoxide in if any leaving group is there and forms ring again.

1 mole $R-\overset{O}{\overset{\|}{C}}-Cl$ + 1 mole $R-MgX \longrightarrow \frac{1}{2}$

S_N1 order

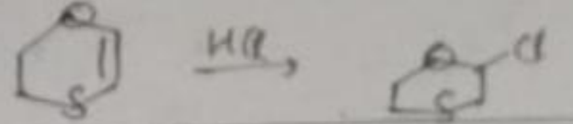


(viii) Nature of medium

PATH	Reactants	Transition state	Charge in transition state relative to starting reactants	How an increase in solvent polarity affects the rate
S_N1	$R-X$	$R^{+\delta} \cdots X^{-\delta}$	Separation of unlike charges (Increases).	large increase in rate of r×n
S_N1	$R-X^{+}$	$R^{+\delta} \cdots X^{+\delta}$	Dispersal of charge	small decrease.
S_N2	$R-X + Y^{-}$	$Y^{-\delta} \cdots R \cdots X^{-\delta}$	Dispersal of charge	small decrease
S_N2	$R-X + Y$	$Y^{+\delta} \cdots R \cdots X^{-\delta}$	separation of unlike charge	large increase
S_N2	$R-X^{+} + Y^{-}$	$Y^{-\delta} \cdots R \cdots X^{+\delta}$	Dispersal of charge	large decrease
S_N2	$R-X^{+} + Y$	$Y^{+\delta} \cdots R \cdots X^{+\delta}$	Dispersal of charge	small decrease.

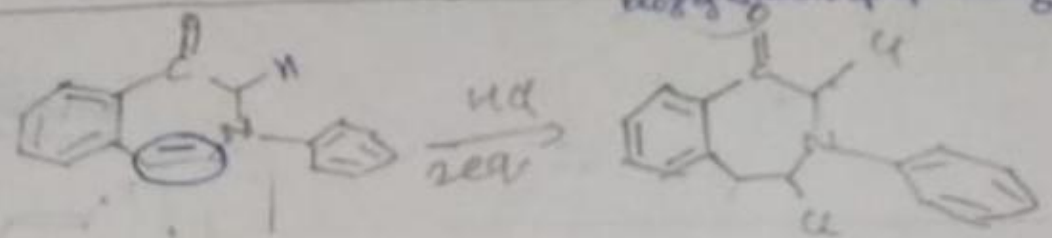
Ex. (5) :- $Cl-CH=CH_2 \xrightarrow{HCl} Cl_2C-CH_3$ Geminal dihalide

Ex (6) :-

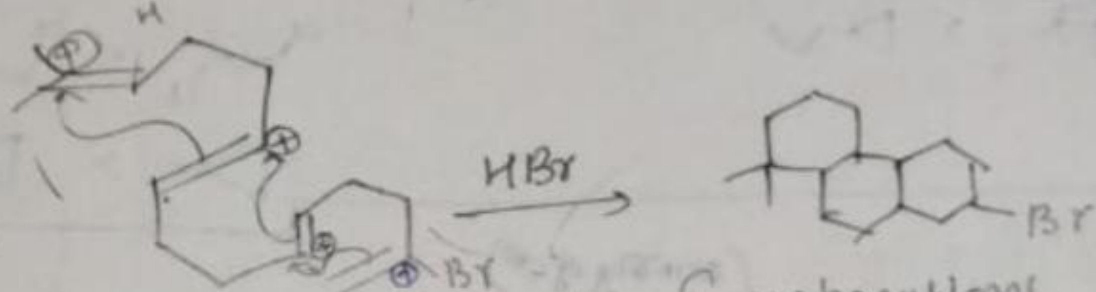


[Refer other class] Oxygen stabilises more than sulphur because of effective 2p-2p than 2p-3p overlap

Ex (7) :-

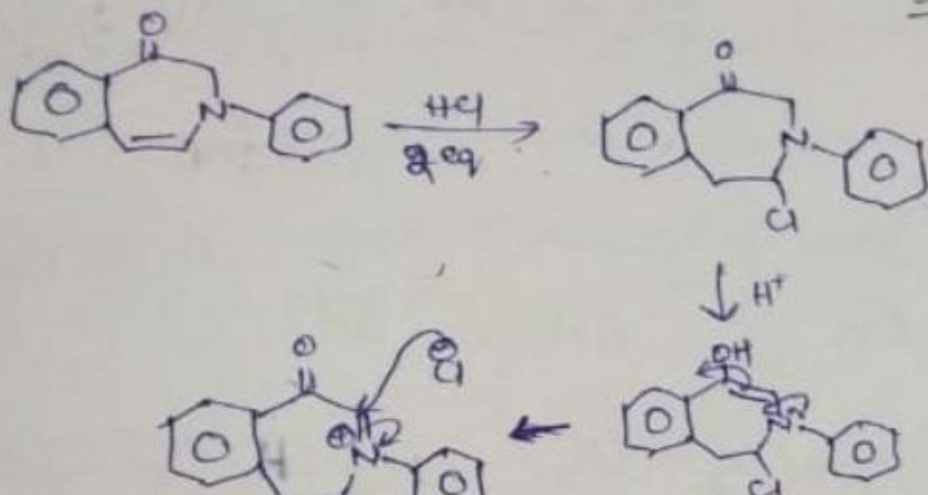


Q

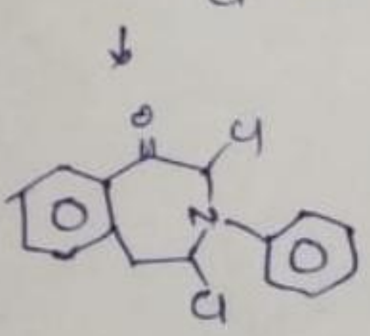


No. of carbocations = 4

Ex:7

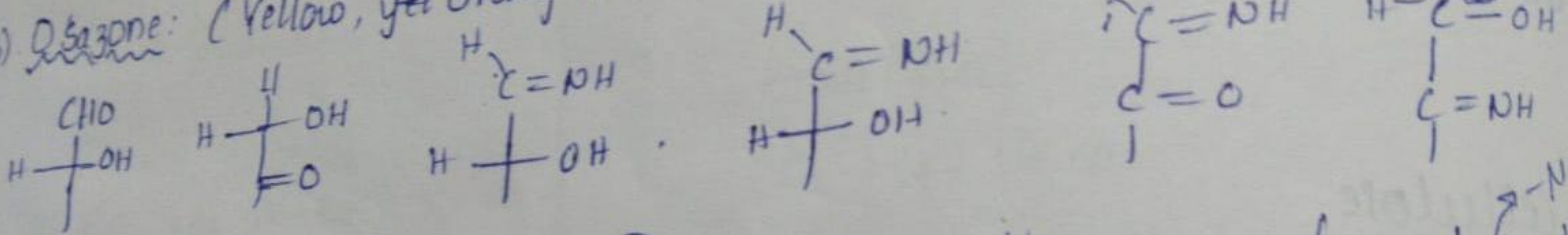


['N' is more stabilising than 'O']

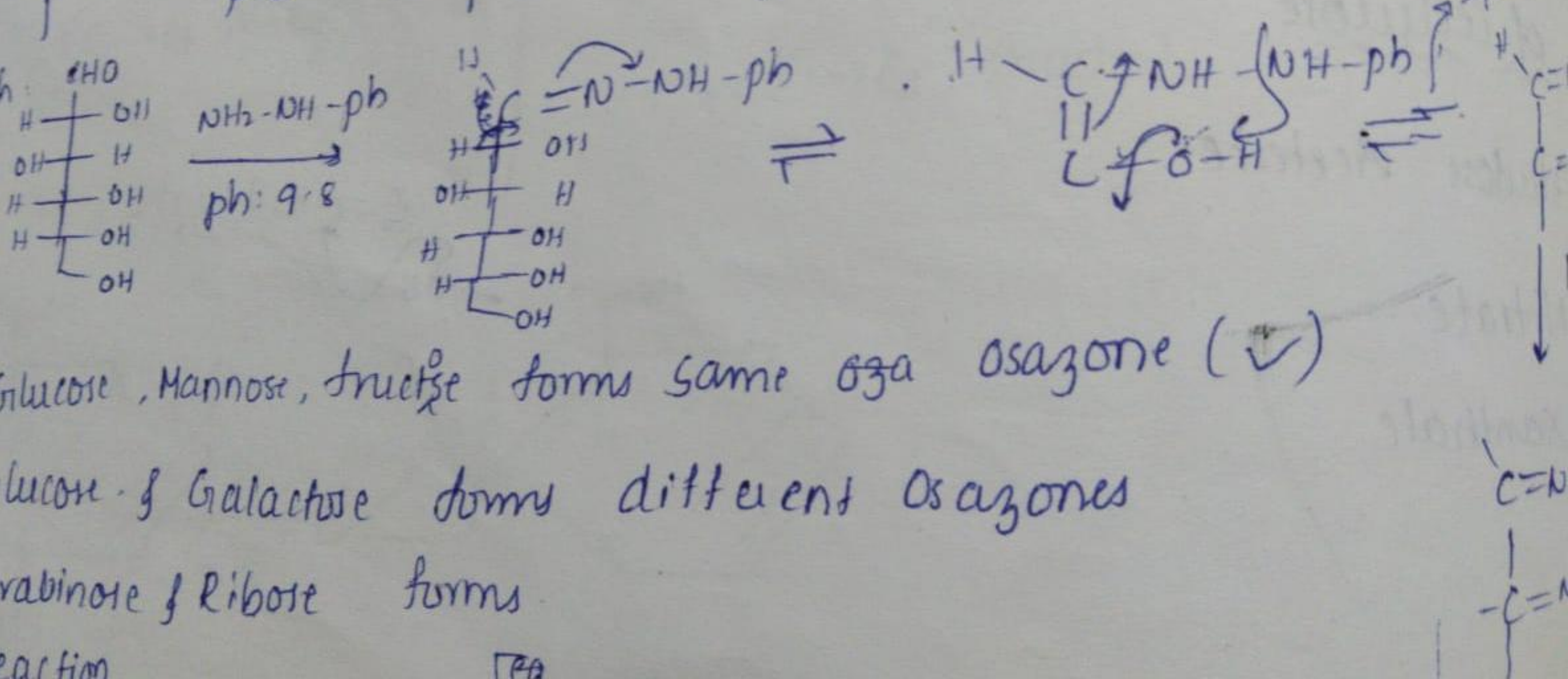


shows this test

3) Osazone: (Yellow, ~~yel~~ Orange, Red ~~s~~olid) (230 m.p)



Mech



* Glucose, Mannose, fructose forms same ~~oza~~ osazone (✓)

* Glucose & Galactose forms different Osazones

* Arabinose & Ribose forms

Net reaction

$$\left.\begin{matrix}1^\circ\\2^\circ\\3^\circ\end{matrix}\right\}\xrightarrow{S_N^1} \underset{\text{MAJOR}}{R-\overset{\oplus}{N}\equiv\overset{\ominus}{C}} \qquad \text{MINOR.}$$

HSAB PRINCIPLE (Hard soft acid base)

→ $\left\{\begin{matrix}\text{Hard acid, Hard Base}\\ \text{Soft acid, Soft Base.}\end{matrix}\right\}$ are more stable. others all are least stable.

→ HB: more (EN DONOR) SB: less EN DONOR

HA: S_N^1 Carbo cation SA: S_N^2 carbo cation

REACTIONS WITH KNO_2

→ $\overset{\delta+}{R}-\overset{\delta-}{X} \xrightarrow{KNO_2} R-NO_2$ (major)

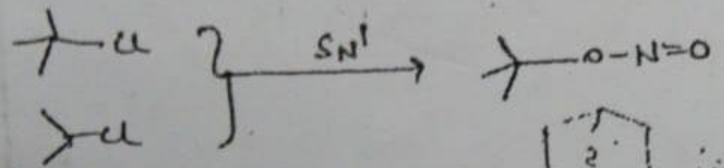
REACTIONS WITH KNO_2

→ $R-X$ $\xrightarrow{KNO_2}$ $R-NO_2$ (major)

$\rightarrow$Cl (3°) $\xrightarrow{KNO_2}$ $-NO_2$ (major) [LHB]

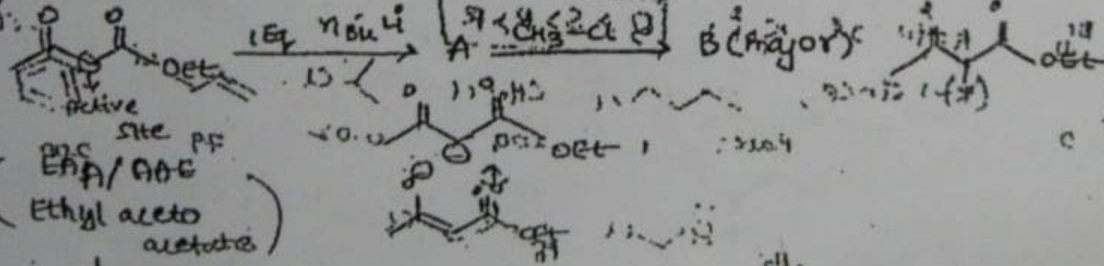
remark ... substitution ... $-O-N=O$

$AgNO_2$:



✓ $CH_3-CH_2-Cl \xrightarrow{S_N2} CH_3-CH_2-NO_2$ (Exception)

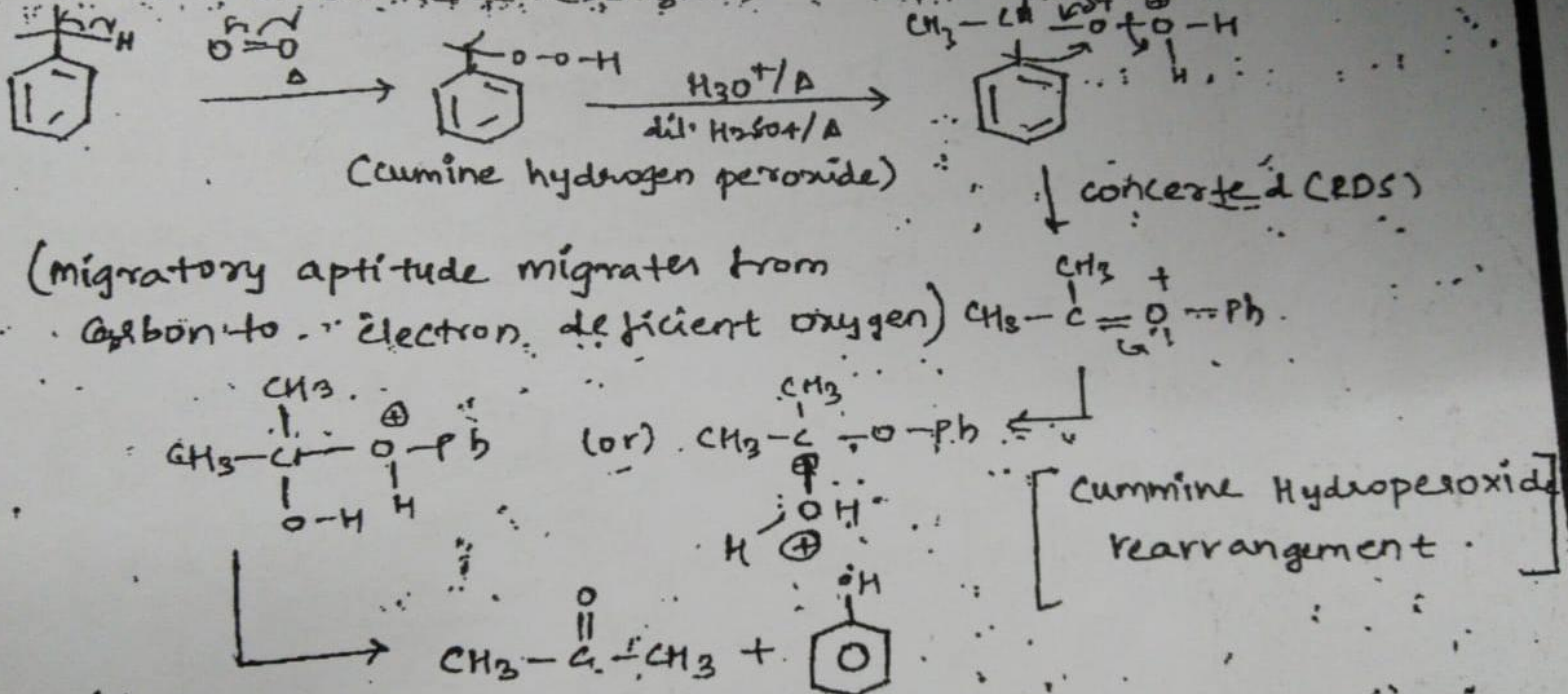
Q)



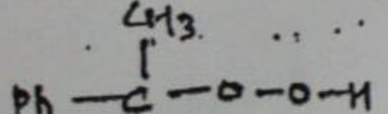
(EAA/AAE
Ethyl aceto
acetate)

at high temp. free radical mechanism takes place.
weaker bonds gets dissociated.

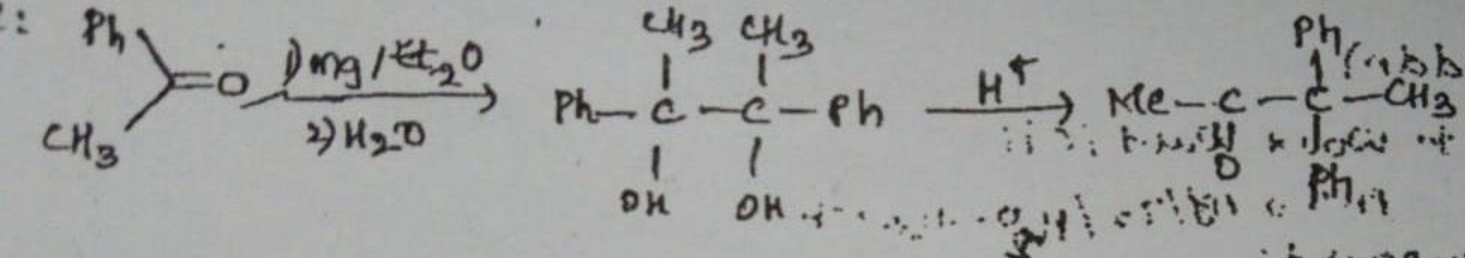
C–H < O=O < π C=C (benzene)



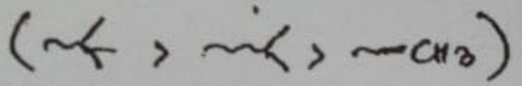
(equally formed).

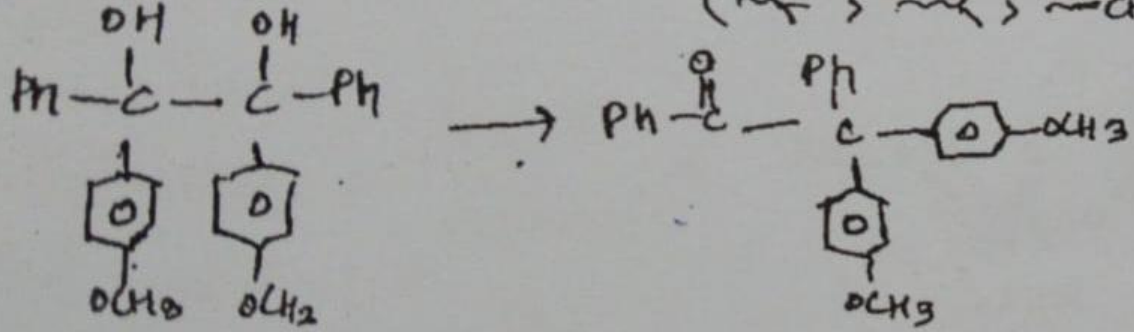


RDS step is (ii).

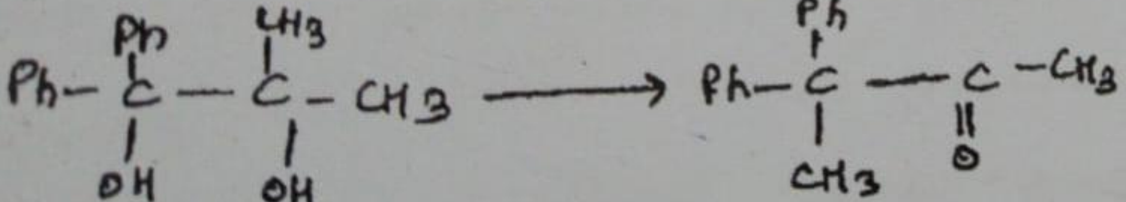


Migratory order: $(-Ph > -H > R)$





→ Among phenyl donating grps are faster than WDG.



In case (i)
(i) If $-Z$ is 'H' $\Rightarrow$ product is imine ($>$=NH)
(ii) ~~If -Z is~~

NOTE → $NaBH_4$ reduces imine to corresponding amine.

(ii) if $-Z$ is 'R' $\Rightarrow$ product is N-alkyl imine ($>$=N-R)
(iii) if Z is 'Ar' $\Rightarrow$ $>$=N-Ar (N-Aryl imine).

NOTE :-

Schiff's reagent :- Generally carbonyl compd (best aromatic aldehyde) reacts with, generally primary amine (best aromatic 1° amine) to gives N-alkyl or N-aryl imine known as Schiff's base, ~~which is p~~ (pink in color) which when passed through SO_2 gas becomes colourless soln commonly known as Schiff's reagent or pararosaniline or rosaniline hydrochloride soln

Use :- To detect aldehydes only.
Observation :- becomes coloured (generally Magenta)
Exception :- Acetone shows Schiff's test.

(iv) if $Z \equiv -NH_2 \Rightarrow$ Hydrazine $\Rightarrow$ Hydrazone $\xrightarrow{\text{Base}}$ Alkane + $N_2\uparrow$
(v) if $Z \equiv$ -NH-ph $\Rightarrow$ Phenyl Hydrazine $\Rightarrow$ phenyl Hydrazone
(vi) if $Z \equiv$ -NH-$C_6H_3(NO_2)$-NO_2 $\Rightarrow$ 2,4-Dinitrophenyl-Hydrazine $\Rightarrow$ 2,4-Dinitrophenyl Hydrazone

other names
* (2,4-DNP)
* Brady's reagent
* Borche's reagent

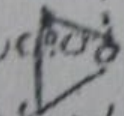
Use :- Used to detect carbonyl compds. (All will give this test)
Observation :- Gives either red, yellow (or) orange colored solid.

(vii) if $Z \equiv -NH-\overset{O}{\overset{\|}{C}}-NH_2$ $\Rightarrow$ semicarbazide $\Rightarrow$ semicarbazone
$>$=N-NH-$\overset{O}{\overset{\|}{C}}$-$NH_2$

NOTE :- Like hydrazine semicarbazone also gives alkane upon rxn with alkali, also known ~~also known~~ as Wolf-Kishner reduction.

GRIGNARD REAGENT:

ORDER OF REACTIVITY.

Active site >  > Carbonyl Comp > Acid chlorides > anhydride > Esters > Alkyl halides.

R–C(=O)–Cl

R–C(=O)–O–C(=O)

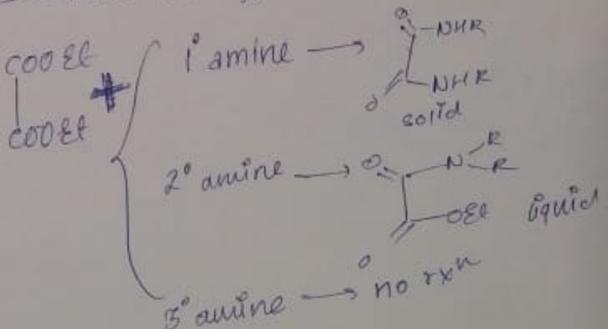
R–Cl

R–COOR

(C) 3° amine

Doesn't form white solid, no rx^n occurs.

Rxn with diethyl oxalate (NO) ⇒ known as Hoffmann's method.



Hoffmann's mustard oil test:

(1) $R{-}NH_2 + S{=}C{=}S \longrightarrow R{-}NH{-}\overset{S}{\overset{\|}{C}}{-}SH \xrightarrow{HgCl_2} HgS\downarrow + R{-}N{=}C{=}S$

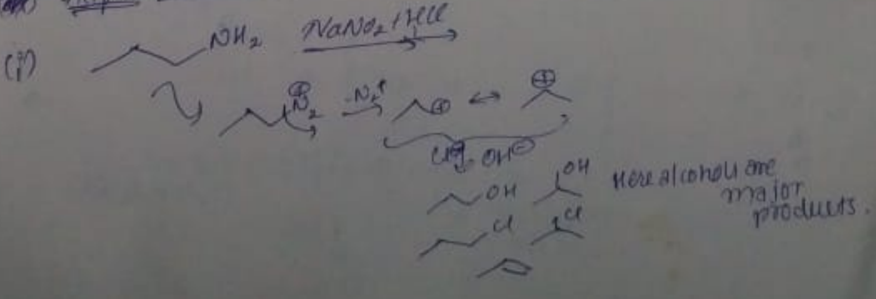
possess smell of mustard oil; HgS black ppt; N-alkyl isothiocyanate.

(2) $R{-}NH{-}R + CS_2 \longrightarrow R{-}\underset{R}{N}{-}\overset{S}{\overset{\|}{C}}{-}SH \xrightarrow{HgCl_2} \cancel{HgS\downarrow}$

(3) $R_3N \xrightarrow{CS_2}$ no rx^n

Rxn with nitrous acid Imp. for Advanced!

(A) Aliphatic 1°-amine



The effect of the following groups in increasing acidity order is

$$Ph < I < Br < Cl < F < CN < NO_2 < CF_3$$

Thus, the following acids are arranged in order of increasing acidity (based on pK_a values):

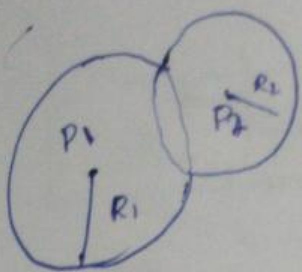
$CF_3COOH > CCl_3COOH > CHCl_2COOH > NO_2CH_2COOH > NC\text{-}CH_2COOH >$

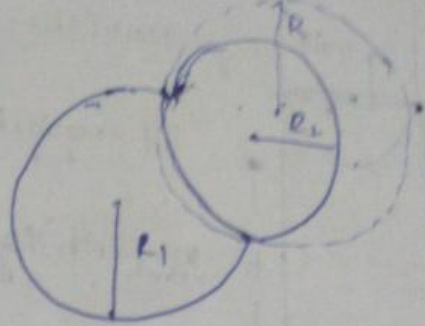
$FCH_2COOH > ClCH_2COOH > BrCH_2COOH > HCOOH > ClCH_2CH_2COOH >$
(continue)

$C_6H_5COOH > C_6H_5CH_2COOH > CH_3COOH > CH_3CH_2COOH$
(continue)

Direct attachment of groups such as phenyl or vinyl to the carboxylic

Double bubble





P_0

$$\Delta P = P_1 - P_0 = \frac{4T}{R_1}$$

$$\Delta P = P_2 - P_0 = \frac{4T}{R_2}$$

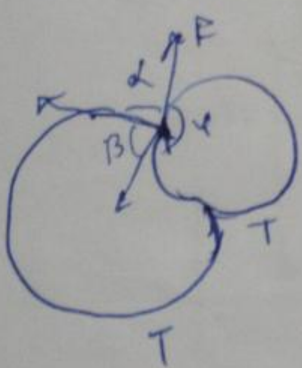
$$\Delta P = P_1 - P_2 = \frac{4T}{R}$$

$$\frac{4T}{R_1} - \frac{4T}{R_2} = \frac{4T}{R}$$

$$\frac{1}{R_1} - \frac{1}{R_2} = \frac{1}{R}$$

$$\boxed{R = \frac{R_1 R_2}{R_1 - R_2}}$$

te

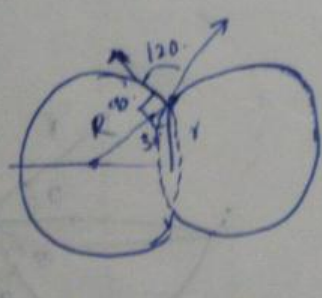


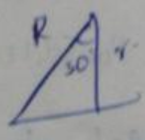
$\boxed{\alpha = \beta = \gamma = 120^\circ}$

Because particles is in equilibrium under equal forces.

f $R_1 = R_2$.

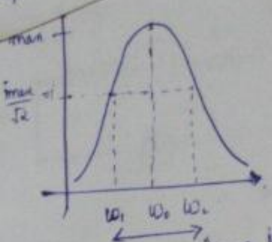
$$R = \frac{R_1 R_2}{R_1 - R_2} \approx \infty$$





$$\cos 30 = \frac{r}{R}$$

$$r = R\left(\frac{\sqrt{3}}{2}\right)$$



$\omega_2 - \omega_1$ is called Band width of Circuit

ω_1 and ω_2 are frequencies related to half of max power

$P_{max} = i_{max}^2 \cdot R$

$\frac{P_{max}}{2} = i^2 R$

$\frac{i_{max}^2 \cancel{R}}{2} = i^2 \cancel{R}$

$$\boxed{i = \frac{i_{max}}{\sqrt{2}}}$$

$\omega_0 = \frac{1}{\sqrt{LC}}$

$i_0 = \frac{V_0}{\sqrt{R^2 + (X_L - X_C)^2}}$

$\frac{i_{max}}{2} = \frac{V_0}{\sqrt{R^2 + (X_L - X_C)^2}}$

$\frac{\cancel{V_0}}{\sqrt{2}R} = \frac{\cancel{V_0}}{\sqrt{R^2 + (X_L - X_C)^2}}$

$(X_L - X_C)^2 + R^2 = 2R^2$

$(X_L - X_C)^2 = R^2$

$X_L - X_C = \pm R$

$\omega L - \frac{1}{\omega C} = \pm R$

$\omega^2 LC - 1 = \pm \omega CR$

$\omega^2 LC \mp \omega CR - 1 = 0$

$\omega = \frac{\pm CR \pm \sqrt{C^2R^2 + 4LC}}{2LC}$

$$\left\{ \begin{aligned} \omega_1 &= \frac{-RC \pm \sqrt{C^2R^2 + 4LC}}{2LC} \\ \omega_2 &= \frac{\sqrt{C^2R^2 + 4LC} + RC}{2LC} \end{aligned} \right\}$$

$\omega_2 - \omega_1$ = band width of circuit

$= \frac{2R\cancel{C}}{2L\cancel{C}} = \frac{R}{L}$

~~Q factor =~~ Q-factor = ~~$\frac{\text{band width}}{\text{Resonance angular frequency}}$~~ $= \frac{\text{Resonant angular frequency}}{\text{Band width}}$

$= \frac{\omega_0}{\omega_2 - \omega_1}$

$= \frac{\frac{1}{\sqrt{LC}}}{\frac{R}{L}}$

$= \frac{1}{R} \cdot \frac{L}{\sqrt{LC}}$

$$\boxed{\text{Q-factor} = \frac{1}{R}\sqrt{\frac{L}{C}}}$$

Q-factor = $\left(\frac{\text{Voltage across inductor or capacitor}}{\text{Net voltage}} \right)$

$= \left(\frac{V_L}{V_{net}} \text{ or } \frac{V_R}{V_{net}} \right)$

$= \left(\frac{X_C}{R} \text{ or } \frac{X_L}{R} \right)$

$= \frac{1}{\omega CR} \text{ or } \frac{\omega L}{R} = \frac{1}{R}\sqrt{\frac{L}{C}} \text{ or } \frac{1}{R}\sqrt{\frac{L}{C}}$

$$\boxed{\text{Q-factor} = \frac{1}{R}\sqrt{\frac{L}{C}}}$$

wire $= \frac{K\lambda}{d}(\sin\alpha + \sin\beta) \to E_\perp$

$= \frac{K\lambda}{d}(\cos\beta - \cos\alpha) \to E_\parallel$

loop $= \frac{2K\lambda}{R}\sin\left(\frac{\alpha}{2}\right)$

Gamma function

$$\Gamma n = \int_0^\infty e^{-x} \cdot x^{n-1}\, dx$$

properties

1) $\Gamma n+1 = n\Gamma n$

2) $\Gamma n+1 = n!$

3) $\Gamma \frac{1}{2} = \sqrt{\pi}$

4) $\Gamma 1 = 1$

$$\int_0^{\pi/2} \sin^m x \cdot \cos^n x \, dx = \frac{\Gamma \frac{m+1}{2} \, \Gamma \frac{n+1}{2}}{2\Gamma \frac{m+n+2}{2}}$$

Wallis formula

$$\int_0^{\pi/2} \sin^n x \, dx = \frac{n-1}{n} \cdot \frac{n-3}{n-2} \cdot \frac{n-5}{n-4} \cdots I_0 \text{ if } n \text{ is even}$$

$$= \frac{n-1}{n} \cdot \frac{n-3}{n-2} \cdot \frac{n-5}{n-4} \cdots \frac{2}{3} \cdot I, \text{ if } n \text{ is odd}$$

(a). $\int_0^{\pi/2} \sin^6 x \, dx = \int_0^{\pi/2} \sin^6 x \cdot \cos^0 x \, dx$

$$= \frac{\Gamma \frac{6+1}{2} \, \Gamma \frac{0+1}{2}}{2\Gamma \frac{6+2}{2}} = \frac{\Gamma \frac{7}{2} \, \Gamma \frac{1}{2}}{2\Gamma 4} = \frac{\frac{5}{2} \Gamma \frac{5}{2} \cdot \sqrt{\pi}}{2 \times 3!}$$

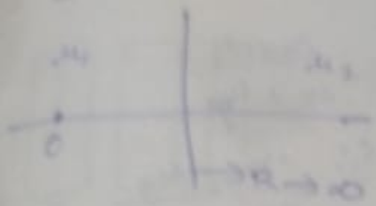
$$= \frac{\frac{5}{2} \cdot \frac{3}{2} \cdot \frac{1}{2} \Gamma \frac{1}{2} \cdot \sqrt{\pi}}{12}$$

$$= \frac{5 \times 3 \, \pi}{96}$$

$$= \frac{15\pi}{96}$$

33) ABC
34) A+1

Refraction of Plane Surfaces



$$\boxed{\frac{\mu_2}{v} = \frac{\mu_1}{u}}$$

Q. Consider a pond of water containing water till a depth 'h' if an observer views the base of the pond along a normal to the free surface then find the depth as observed by him.

Sol. $\frac{\mu}{v} = \frac{1}{H} \Rightarrow H_{app} = \frac{H_{real}}{\mu}$

Note: The observed depth = H_{app} = apparent depth
the actual depth = H_{real} = real depth

Q.

Find
i) Distance of ~~the image~~ bird as seen by the fish from it
ii) Dist. of the fish as seen by the bird from it

Sol. i) $\frac{4}{3v} = \frac{1}{-40} \Rightarrow v = \frac{-160}{3}$

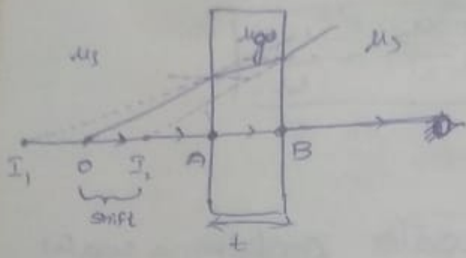
$d = \frac{160}{3} + 60 = \frac{340}{3}$

ii) $\frac{1}{v} = \frac{4}{180} \Rightarrow v = \frac{180}{4} = 45cm$

$d = 85cm$

6) ABD+3
6) BD—
23) ABC-
24) A+1
25) 6

Refraction through parallel sided glass slab



Case-1

$\mu_s < \mu_g$

S_1: $\frac{\mu_g}{-AI_1} = \frac{\mu_s}{-AO}$

$\Rightarrow AI_1 = AO \cdot \frac{\mu_g}{\mu_s}$ —(1)

S_2: $BI_1 = AI + AB$

$BI_1 = \frac{\mu_g}{\mu_s} AO + t$

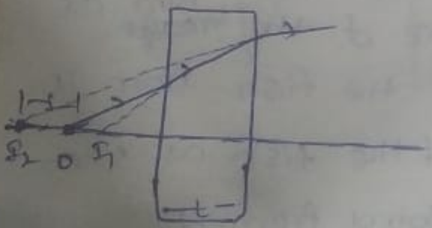
$\frac{\mu_s}{BI_2} = \frac{\mu_g}{BI_1} \Rightarrow BI_2 = \frac{\mu_s}{\mu_g} \cdot BI_1 = AO + \frac{\mu_s}{\mu_g} \cdot t$

$AI_2 = BI_2 - AB = AO + \left[\frac{\mu_s}{\mu_g} t - t\right]$

$\Rightarrow AO - AI_2 = t\left[1 - \frac{\mu_s}{\mu_g}\right]$ $\frac{\mu_g}{\mu_s} = \mu_{rel}$

$= t\left[1 - \frac{1}{\mu_{rel}}\right]$

Case-II



$s = t\left[1 - \frac{1}{\mu_{rel}}\right]$

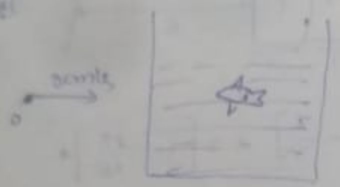
$\mu_r = \frac{\mu_g}{\mu_s}$

1) AD
2) AB
3) AC
4) AC

17) D+1 (AC)
18) BCD (A)
19) AB (D)

Q Figure shows a cubical container filled with water, a fish is moving towards one of the walls at a speed of 4cm/s and an observer also approaching that wall at a speed of 3cm/s as shown. Find i) speed of O seen by f
ii) speed of f seen by O

Sol:



i) $v_{f/O}$

$$\frac{\mu_2}{v} = \frac{\mu_1}{u}$$

$$\frac{1}{3v_f} = \frac{4}{3x_f}$$

$$\Rightarrow v_f = \frac{3}{4} x_f$$

$$\Delta x_{f/O} = x_O + v_f$$

$$= x_O + \frac{3}{4} x_f$$

by differentiate

$$\vec{v}_{f/O} = -3 + \frac{3}{4}(-4)$$

$$= -6 \text{ cm/s}$$

ii) $\vec{v}_{O/f}$

$$\frac{\mu_2}{v} = \frac{\mu_1}{u} \Rightarrow \frac{4}{3v_O} = \frac{1}{x_O} \Rightarrow v_O = \frac{4}{3} x_O$$

$$\Delta x_{O/f} = x_f + v_O = x_f + \frac{4}{3} x_O$$

by diff

$$\Rightarrow \vec{v}_{O/f} = -4 + \frac{4}{3}(-3) = -8 \text{ cm/s}$$

Q How much water should be filled in container of height 21cm so that it will appear half filled when viewed along normal to water surface $(\mu_w = \frac{4}{3})$

4) B(C   ii) A(B+ ...

Q A light ray incident on the point on the surface of the glass sphere of $\mu = \sqrt{3}$ at angle of incidence 60°. It is reflected and refracted at the farther surface of sphere. Find angle b/n reflect & refract ray

Ans

$$\frac{\sqrt{3}}{2 \cdot \sin r} = \sqrt{3} \Rightarrow r = 3$$

$$\Rightarrow \boxed{\text{angle} = 90}$$

Q A ray of light travels from a liquid of R.I. into air. If incident beam is rotating at const rate ω then what is the angular speed of refracted beam at the instant the angle of incident is 30° $[\mu = \sqrt{2}]$ $[\omega = \frac{1}{\sqrt{6}} \text{ rad/sec}]$

Sol

$$\mu \cdot \sin i = \sin r$$

$$\mu \cdot \cos i \cdot \frac{di}{dt} = \mu \cdot \cos r \cdot \frac{dr}{dt}$$

$$\frac{dr}{dt} = \frac{\frac{\sqrt{3}}{2} \times \frac{1}{\sqrt{6}} \times \sqrt{2}}{\sqrt{2} \times \frac{\sqrt{2}}{2\sqrt{2}} \cdot \frac{1}{\sqrt{2}}} = \frac{\sqrt{3}}{\sqrt{2}} = \frac{1}{\sqrt{4}}$$

$$= \boxed{\frac{1}{\sqrt{2}}}$$

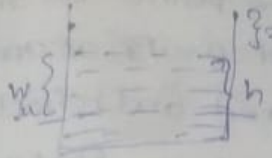
$\mu = \frac{\sin i}{\sin r}$

$\sin r = \frac{1}{2\sqrt{2}}$

$\cos r = \sqrt{1 - \frac{1}{8}}$

$= \frac{1}{\sqrt{2}}$

Sl

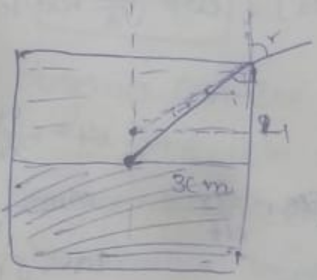


$$\frac{h}{\mu} = 21 - h$$

$$\Rightarrow \frac{3}{4}h = 21 - h \Rightarrow \boxed{h = 12\,cm}$$

Q A small obj is kept at centre of bottom of cylindrical beaker of diameter 6cm and height 4cm filled completely with water ($\mu = \frac{4}{3}$) consider the light ray from the obj leaving the beaker through a corner. If this ray and the ray along the axis of beaker is used to locate the image. Find the appare depth in this case

Sl



$\sin i =$

$\tan i = \frac{3}{4}$ $i = 37$

$\tan r = \frac{3}{x}$

i did wrong.

$\frac{4}{3} = \frac{\sin i}{\sin r}$

$x = \frac{16}{3}$

$\frac{4}{3} = \frac{3}{5 \sin r} \Rightarrow \sin r = \frac{9}{20}$

$\frac{4}{3} = \frac{\sin r \times 5}{3}$

$r = 53$

$\tan 53 = \frac{3}{x}$

$\frac{4}{3} = \frac{3}{x} \Rightarrow x = \frac{9}{4}$

$= 2.25$

Q. A parallel beam of width 't' is incident from air on to a boundary b/n air and water. find the width of the refracted beam ($\mu = \frac{4}{3}$)

t' & remains same

$\frac{1}{\sqrt{2}\,\sin r} = \frac{4}{3}$

$\sin r = \frac{3}{4\sqrt{2}}$

$\cos r = \sqrt{1 - \frac{9}{32}}$

$= \frac{\sqrt{23}}{4\sqrt{2}} = \frac{t'}{AB}$

$\Rightarrow AB = \frac{4\sqrt{2}}{\sqrt{23}} \cdot t'$

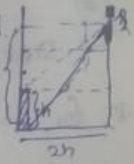
$\cos 45 \quad \frac{1}{\sqrt{2}} = \frac{t}{AB}$

$AB = t\sqrt{2}$

$t' \cdot \frac{4\sqrt{2}}{\sqrt{23}} = t \cdot \sqrt{2}$

$\boxed{t' = \frac{t\sqrt{23}}{6}}$

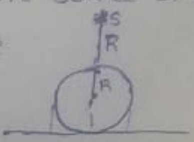
Q. An observer can see through a pinhole, the top end of the thin rod of height 'h'. When the beaker is filled with a liquid of height '2h'. he can see the lower end of the rod



Sol

$\sqrt{\frac{5}{2}}$

Q. An opaque sphere of radius 'R' lies on a horizontal plane on the perpendicular to through the point of contact there is a point source of light at a dist. R above the sphere



i) find the area of shadow on the plane. $3\pi r^2$

ii) A transparent liquid of $\mu = \sqrt{3}$ is filled above the plane such that sphere is just covered with liquid find the new area of shadow formed

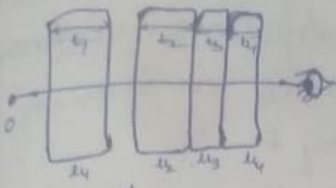
ABC

(B)

(i) AC

slab

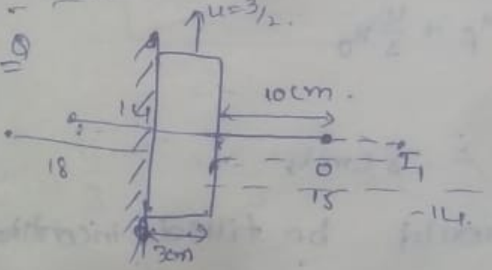
note:



$$S = \sum_{i=1}^{N} t_i\left(1-\frac{1}{\mu_{r_i}}\right)$$

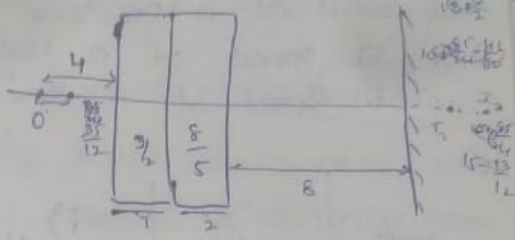
Note: Even if slabs are kept in contact with each other, we can use the form. d shift directly by assuming negligible thickness of the air surrounding to be present b/n the two slabs.

Q



Q find the location of the final image wrt to obj.'s initial location

Sol



$$S = 1\left[1-\frac{2}{3}\right] + 2\left[1-\frac{5}{8}\right]$$

$$= \frac{1}{3} + \frac{3}{4} = \frac{13}{12}$$

$$S = 2\left[1-\frac{5}{8}\right] + 1\left[1-\frac{2}{3}\right]$$

$$= \frac{3}{4} + \frac{1}{3} = \frac{13}{12}$$

$$S = 8 + \frac{1}{2} \quad 15 + \frac{26}{12}$$

$$= \frac{334}{12}$$

Note: Even

$$\frac{3}{2v} = \frac{1}{-10}$$

$v = -15\text{cm}$

$$\frac{1}{v} = \frac{3}{-2\times\frac{21}{2}}$$

$v = -14$

(dis = 24cm