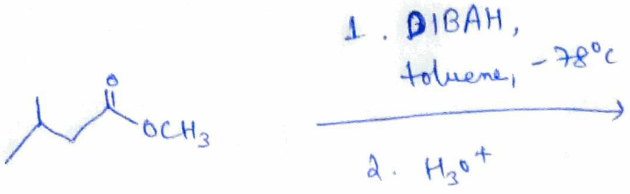
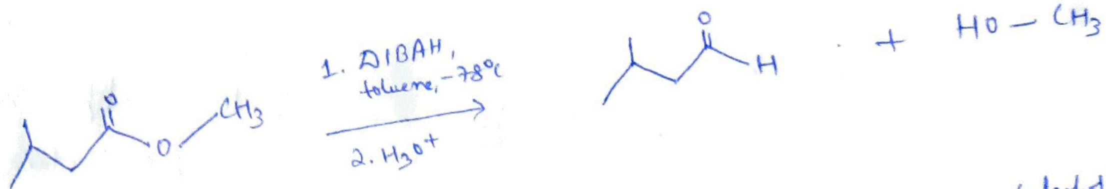
1. What is the major organic product obtained from the following reaction ?



Ans :-



(ester) (aldehyde) (alcohol)

Ans

Point to be noted :-

- The reaction of ester with DIBAH to form aldehydes. This reaction is performed at −78°c to prevent reaction with the formed aldehyde product.

- $R-\overset{O}{\overset{\|}{C}}-OR$, $R-C\equiv N$, $R-\overset{O}{\overset{\|}{C}}-OH$ $\xrightarrow[\text{di isobutyl Aluminum (Al) hydride (DIBAH)}]{\text{DiBAL}-H}$ $R-\overset{O}{\overset{\|}{C}}-H$

Q4 In a reaction, $2A_2 + B_2 \longrightarrow 2A_2B$, when the reactant A will disappear?

Ans:-

$$2A_2 + B_2 \longrightarrow 2A_2B$$

we know that;

rate of disappearance of reactant = rate of appearance of product.

$$\text{rate} = -\frac{1}{2}\frac{d[A_2]}{dt} = -\frac{d[B_2]}{dt} = \frac{1}{2}\frac{d[A_2B]}{dt}$$

(Here, -ve sign indicates that concentration of reactant decrease.)

$$\therefore -\frac{1}{2}\frac{d[A_2]}{dt} = -\frac{d[B_2]}{dt}$$

$$\left(-\frac{d[A_2]}{dt}\right) = 2\left(-\frac{d[B]}{dt}\right)$$

$\therefore$ $\boxed{\left(\text{rate of disappeence of } A_2\right) = 2\left(\text{rate of disappearence of } B_2\right)}$

Ans

2. The density of a solution prepared by dissolving 120 g of urea (M.wt = 60 u) in 1000 g of water is 1.15 g/ml. The molarity of this solution is?

Ans:-

Given,

Solute	Solvent
Wt = 120 g	W_B = 1000 g of water
M.wt = 60	

$\Downarrow$

$\rho = 1.15$ g/ml (given)

So, total mass of Resulting solution = mass of urea + mass of water

$= 120 + 1000$

$= 1120$ g.

Given, Density of soln ; $\rho = 1.15$

$\frac{m}{V} = 1.15$

$\Rightarrow V = \frac{m}{1.15}$

$= \frac{1120 \text{ g}}{1.15 \text{ g/ml}}$

$\therefore$ $\boxed{\text{total volume of soln} = 973.91304 \text{ ml}}$

Molarity or molar concentration, $M = \frac{\text{no. of moles of solute}}{\text{total volume of solution (in L)}}$

$= \frac{\frac{Wt}{M.wt}}{\frac{973.91304}{1000}}$

$= \frac{120}{60} \times \frac{1000}{973.91} = 2.05357$

$\therefore$ $\boxed{\text{The molarity of this solution is } 2.05 \text{ M}}$ Ans

3. How the bond dissociation enthalpy changes as one goes along the series of diatomics

Li_2 , B_2 , C_2 , N_2 , O_2 & F_2 ?

Ans:- $\boxed{\text{increases then decreases}}$ **Ans**

Ionisation Enthalpy $\propto$ Zeff

$\propto \frac{1}{\text{size}}$

$\propto$ E.N (Electronegativity)

Zeff → increases

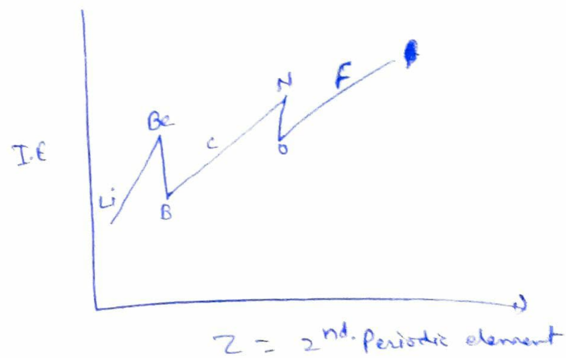
I.E → increase

E.N → increase

Zeff → constant

Size → increase

I.E → decreases



(1)

I.E: $\underline{C < N > O}$

as p^3 factor dominate.

Li_2	B_2	C_2	N_2	O_2	F_2
$1s^2 2s^1$	$1s^2 2s^2 2p^1$	$1s^2 2s^2 2p^2$	$1s^2 2s^2 2p^3$	$1s^2 2s^2 2p^4$	$1s^2 2s^2 2p^5$
Li–Li		:C=C:	N≡N	O=O	F–F

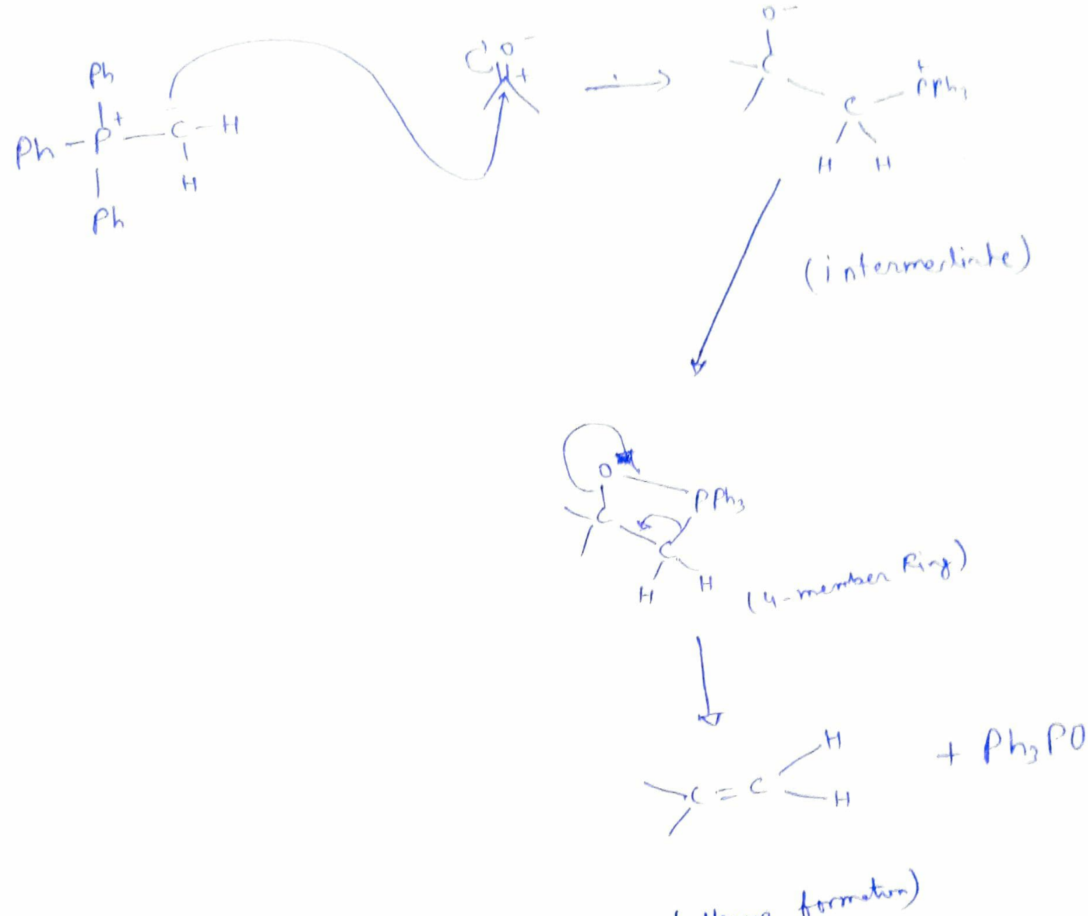
As we can see from (1) or graph I.E Vs Z & structure ; we can conclude as following:-

$\boxed{Li_2 , B_2 , C_2 , N_2 , O_2 \ \& \ F_2}$

→ bond dissociation enthalpy At first increases from Li_2 to N_2 then decrease from N_2 to F_2

5. What is the major organic product obtained from the following reaction?

Ans:-



Ans

Point to be Noted: The reaction of $Ph_3P^+-\bar{C}H_2$ with aldehyde or ketone is called **Witting Reaction**. The basic idea behind this Reaction mechanism is;

aldehyde or Ketone + triphenyl Phosphine $\xrightarrow[\text{base}]{\text{alkyl halide}}$ alkene at least 1 H

$$R-\overset{O}{\overset{\|}{C}}-H \qquad Ph_3P \xrightarrow[NH_2^-]{R-CH_2-X} R-CH=CH-R$$

$$Ph_3\ddot{P} \qquad R-\overset{+}{C}H_2-X \longrightarrow R-CH_2-\overset{+}{P}-PH_3$$

acidic

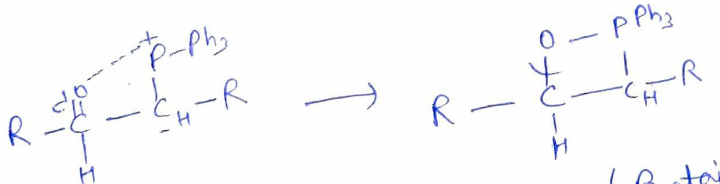
$$\Big\downarrow NH_2^-$$

$$R-\bar{C}H-\overset{+}{P}-Ph_3 \qquad \text{(Reagent Prepared)}$$

$$\downarrow$$

$$R-CH=PPh_3$$

(alkylidene triphenyl phosphonium or yield)



(Betaine) → 4 member Ring

$$\downarrow$$

$$R-\underset{H}{C}=CH-R \quad + \quad Ph_3-\overset{O}{\overset{\|}{P}}$$

Hence,

$$\boxed{\;\overset{O}{\overset{\|}{\wedge}} \xrightarrow{Ph_3\overset{+}{P}-\bar{C}H_2} \;\rangle C=C \quad + \quad Ph_3PO\;}$$

Q6 if the volume of reaction vessel is suddenly reduced to 1/4th of initial value. How new rate will be affected?

Ans:- Lets take the following reaction;

$$\underset{(\text{reactant})}{A} \longrightarrow \underset{(\text{Product})}{P}$$

	A	P
$t = 0$	x	0
$t = t$	$x - a$	a

Rate law can be written as;

$$r = K[A]$$

$$= K\left[\frac{n_A}{V}\right]$$

given, $V_1 = \frac{1}{4}V$

New rate law can be written as;

$$\therefore r_1 = K\left[\frac{n}{V_1}\right]$$

$$= K\left[\frac{n}{V}\right] \cdot 4$$

$$\boxed{r_1 = r \cdot 4}$$

$\therefore$ if the volume of reaction vessel is suddenly reduced to $\frac{1}{4}$th of initial value. Then the New rate will increase 4-time of the initial rate, for $A \rightarrow P$ case.

Ans

7. What is the missing particle for the following nuclear decay process?

$${}^{197}_{55}Cs \longrightarrow {}^{137}_{56}Ba$$

Ans :-

$${}^{137}_{55}Cs \longrightarrow {}^{137}_{56}Ba + \beta^- + \bar{\nu}_e$$

where, $\bar{\nu}_e$ = electron's neutrino

& β^- = a type of radioactive decay in which an atomic nucleus emits beta particle.

Q.10 What is the expression for K_a for the following reactions?

$$CH_3COOH\ (aq.) \rightleftharpoons CH_3CO_2^-\ (aq.) + H^+\ (aq.)$$

Ans:-

$$K_a = \frac{[CH_3CO_2^-\ (aq.)]\ [H^+\ (aq.)]}{[CH_3COOH\ (aq.)]}$$

Q8. What is the relationship between K_c and K_p for the following reaction?

$$A(g) + B(g) \rightleftharpoons 2C(g)$$

Ans..

$$K_c = \frac{[C]^2}{[A][B]} \quad \text{———} \quad (i)$$

where, K_c = equilibrium constant w.r.to molar concentration of gaseous mixture.

$[A]$ = molar concentration of Reactant A

$[B]$: molar contentration of B

$[C]$: molar contentration of C

$$K_p = \frac{[P_c]^2}{[P_A]^* [P_B]} \quad \left[\text{for } A(g) + B(g) \rightleftharpoons 2C(g) \right]$$

——— (ii)

where, K_p = Eqb. const. w.r.t atmospheric pressure

$[P_c]$ = Partial pressure of C

$[P_B]$: Partial pressure of B

$[P_A]$: Partial pressure of A

We know, $PV = nRT$ → molar concentration

$$P = \left(\frac{n}{V}\right) . RT$$

$\therefore$ $P_A = [A] RT$ for Reactant A

similarly $P_B = [B] RT$ & $P_c = [C] RT$

from Eqn (2)

$$K_p = \frac{[P_C]^2}{[P_A][P_B]}$$

$$= \frac{[C]^2 R^2 T^2}{[A]RT \, [B]RT}$$

$$= \frac{[C]^2}{[A][B]} \quad \text{——— (iii)}$$

from Eqn (iii) & (i) we get,

$$\boxed{K_p = K_c}$$ Ans

So, this is relationship between K_p & K_c for the reaction :-

$$A(g) + B(g) \rightleftharpoons 2C(g)$$

Point to be noted :

The relationship between K_c & K_p is given by.

$$\boxed{K_p = K_c (RT)^{\Delta n_g}}$$

where, Δn_g = change in moles of reactant & product (for gaseous state)

for $A(g) + B(g) \rightleftharpoons 2C(g)$

$$\Delta n_g = 2 - (1+1) = 0$$

$$\therefore \boxed{K_p = K_c}$$ Ans

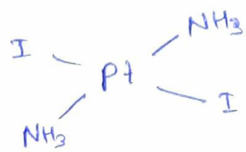
9. How many isomers are possible for the Square Planar complex $[PtI_2(NH_3)_2]$

Ans:-

- Square Planer complex, always optically Inactive as planer geometry always have plane of Symmetry.

- Sq. Planer complex show Geometrical Isomer. & 2 structure is possible for $[PtI_2(NH_3)_2] \longrightarrow \underline{MA_2B_2 \text{ type}}$

cis



trans

$\therefore$ $\boxed{\text{Total no. of isomers for the Square planer complex } [PtI_2(NH_3)_2] = 2}$ Ans