

**MOJZA**

**AS Level**

# **Organic Chemistry**

**Cheat Sheet**

9701



**BY TEAM MOJZA**

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## Types of Reactions

### → Free Radical Substitution Reaction

- Alkane + Halogens

### → Electrophilic Substitution

- Alkene +  $X_2$

### → Nucleophilic Substitution

- $R-X \rightarrow R-OH$
- $R-X \rightarrow R-CN$
- $R-X \rightarrow R-NH_2$
- $R-OH + \text{Halogen Acids} \rightarrow R-X$

### → Elimination Reactions

- $R-X \rightarrow \text{Alkene}$
- $R-OH \rightarrow \text{Alkene}$

### → Nucleophilic Addition

- $R-CO-R' + H-CN \rightarrow R-C(OH)(CN)-R$

### → Oxidation

- Alkene  $\rightarrow$  Diol ( When cold, dilute  $KMnO_4$  is added)
- Alkene  $\rightarrow$  Aldehyde/Ketone/ $CO_2+H_2O$  ( When hot, concentrated  $KMnO_4$  is added)
- Primary Alcohols  $\rightarrow$  Aldehyde ( When acidified  $K_2Cr_2O_7$  is added + Distillation)
- Primary Alcohol  $\rightarrow$  Respective Acid ( When acidified  $K_2Cr_2O_7$  is added + Reflux)
- Secondary Alcohol  $\rightarrow$  Ketone (When acidified  $K_2Cr_2O_7$  is added + Reflux)
- Aldehyde  $\rightarrow$  Acid ( When  $K_2Cr_2O_7/KMnO_4$  or Fehlings or Tollens reagent is added)

### → Reduction

- Acid  $\rightarrow$  Primary Alcohol ( When  $LiAlH_4$  is added)
- Alkenes  $\rightarrow$  Alkane ( When  $H_2$  is added at 200 degrees Celcius with nickel as a catalyst)
- Ketones  $\rightarrow$  Secondary alcohol ( When reducing agent is added)
- Amide  $\rightarrow$  Amines ( When reducing agent is added)

### → Hydrolysis

- Esters + Acid as a reagent  $\rightarrow$  Acid + Alcohol
- Esters + Alkali as a reagent  $\rightarrow$  Salt of carboxylic acid + Alcohol
- Acyl Chlorides + Water  $\rightarrow$  Carboxylic Acid +  $HCl$
- Amides + Acid as a reagent  $\rightarrow$  Carboxylic Acid +  $NH_4^{+1}$
- Amides + Alkali as a reagent  $\rightarrow$  Salt of carboxylic acid +  $NH_3$
- Nitriles + Acid as a reagent  $\rightarrow$  Carboxylic Acid +  $NH_4^{+1}$

- Nitriles + Alkali as a reagent  $\rightarrow$  Salt of carboxylic acid +  $\text{NH}_3$

## Organic Reactions List

1.  $\text{CH}_4 + \text{Cl}_2 \rightarrow \text{CH}_3\text{Cl} + \text{HCl}$
2. Organic Compound +  $\text{O}_2$  (excess)  $\rightarrow \text{CO}_2 + \text{H}_2\text{O}$
3. Organic Compound +  $\text{O}_2$  (limited)  $\rightarrow \text{C} + \text{CO} + \text{H}_2\text{O}$
4.  $\text{C}_2\text{H}_4 + \text{Br}_2 \rightarrow \text{C}_2\text{H}_4\text{Br}_2$
5.  $\text{C}_2\text{H}_4 + \text{H}_2 \rightarrow \text{C}_2\text{H}_6$
6.  $\text{C}_2\text{H}_4 + \text{H}_2\text{O} \rightarrow \text{C}_2\text{H}_5\text{OH}$
7.  $\text{C}_2\text{H}_4 + \text{HBr} \rightarrow \text{C}_2\text{H}_5\text{Br}$
8.  $\text{C}_2\text{H}_4 + [\text{O}] + \text{H}_2\text{O} \rightarrow \text{CH}_2(\text{OH})\text{CH}_2\text{OH}$
9.  $\text{C}_2\text{H}_4 + [\text{O}] \rightarrow \text{CO}_2 + \text{H}_2\text{O}$
10.  $\text{R-X} + \text{NaOH} \rightarrow \text{R-OH} + \text{NaX}$  ( Aqueous NaOH)
11.  $\text{R-X} + \text{NaOH} \rightarrow \text{Alkene} + \text{NaX} + \text{H}_2\text{O}$  (NaOH in ethanol)
12.  $\text{R-X} + \text{KCN} \rightarrow \text{R-CN} + \text{KX}$  ( In ethanol)
13.  $\text{R-X} + \text{NH}_3 \rightarrow \text{R-NH}_2 + \text{HX}$  ( In ethanol)
14.  $\text{R-CN} + \text{H}_2\text{O} + \text{H}^+ \rightarrow \text{RCOOH} + \text{NH}_4^+$
15.  $\text{R-CN} + [\text{H}] \rightarrow \text{RCH}_2\text{NH}_2$
16.  $\text{R-OH} + \text{PCl}_5 \rightarrow \text{RCl} + \text{POCl}_3 + \text{HCl}$
17.  $\text{R-OH} + \text{SOCl}_2 \rightarrow \text{R-Cl} + \text{SO}_2 + \text{HCl}$
18.  $\text{R-OH} + \text{PCl}_3 \rightarrow \text{RCl} + \text{H}_3\text{PO}_3$
19.  $\text{R-OH} + \text{PBr}_3 \rightarrow \text{RBr} + \text{H}_3\text{PO}_3$
20.  $\text{R-OH} + \text{KBr} + \text{H}_2\text{SO}_4 \rightarrow \text{R-Br} + \text{KHSO}_4 + \text{H}_2\text{O}$
21.  $\text{R-OH} + \text{PI}_3 \rightarrow \text{R-I} + \text{H}_3\text{PO}_3$
22.  $\text{R-OH} \rightarrow \text{Alkene} + \text{H}_2\text{O}$  (Dehydration/Elimination)
23.  $\text{R-OH} + \text{R}'\text{COOH} \rightarrow \text{R-O-COR}' + \text{H}_2\text{O}$
24. Aldehyde +  $[\text{O}] \rightarrow \text{Carboxylic Acid} + \text{H}_2\text{O}$
25. Aldehyde +  $[\text{H}] \rightarrow \text{Primary Alcohol}$
26. Ketone +  $[\text{H}] \rightarrow \text{Secondary Alcohol}$
27. Aldehyde + 2,4-DNPH  $\rightarrow \text{Hydrazone} + \text{H}_2\text{O}$
28.  $\text{RCHO} + 2[\text{Ag}(\text{NH}_3)_2]^+ + \text{OH}^- \rightarrow 2\text{Ag} + \text{RCO}_2^- + 4\text{NH}_3 + 2\text{H}_2\text{O}$
29.  $\text{RCHO} + 2\text{Cu}^{+2} + \text{OH}^- \rightarrow \text{Cu}_2\text{O} + \text{RCO}_2^- + 3\text{H}_2\text{O}$
30. Aldehyde/Ketone + HCN  $\rightarrow \text{Cyanohydrin}$
31. Carboxylic Acid + Active metal  $\rightarrow \text{Salt} + \text{H}_2$

32. Carboxylic Acid + Metal Oxide  $\rightarrow$  Salt +  $H_2O$
33. Carboxylic Acid + Metal Carbonate  $\rightarrow$  Salt +  $H_2O$  +  $CO_2$
34. Carboxylic Acid + Alkali  $\rightarrow$  Salt +  $H_2O$
35. Carboxylic Acid + Alcohol  $\rightarrow$  Ester +  $H_2O$
36.  $RCOOH + PCl_5 \rightarrow RCOCl + POCl_3 + HCl$
37.  $RCOOH + PCl_3 \rightarrow RCOCl + H_3PO_3$
38.  $RCOOH + SOCl_2 \rightarrow RCOCl + SO_2 + HCl$
39.  $RCOCl + H_2O \rightarrow RCOOH + HCl$
40.  $RCOOR' + H_2O + H^+ \rightarrow RCOOH + ROH$
41.  $RCOOR' + NaOH(aq) \rightarrow RCOONa + R-OH$
42.  $RCO-NH_2 + H_2O + H^+ \rightarrow RCOOH + NH_4^+$
43.  $RCO-NH_2 + NaOH(aq) \rightarrow RCOONa + NH_3$
44. Carboxylic Acid +  $[H]$   $\rightarrow$  Primary Alcohol
45.  $HCOOH + [O] \rightarrow CO_2 + H_2O$
46.  $HOOC-COOH + [O] \rightarrow CO_2 + H_2O$
47.  $RCOCl + R'OH \rightarrow RCOOR' + HCl$
48.  $R-CO-NH_2$  (Dehydration)  $\rightarrow$   $RCN + H_2O$
49.  $CH_3-CO-CH_3 + I_2$  (With  $NaOH$ )  $\rightarrow$   $CH_3COONa + CHI_3$
50.  $C_2H_5-CH(OH)-CH_3 + I_2$  (With  $NaOH$ )  $\rightarrow$   $CH_3CH_2COONa + CHI_3$

### **A Note from Mojza**

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If you find any issues within these notes or have any feedback, please contact us at [support@mojza.org](mailto:support@mojza.org).

### **Acknowledgements**

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