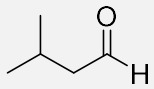
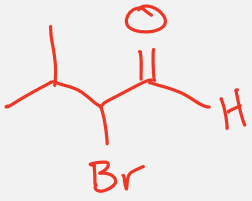
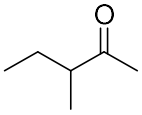
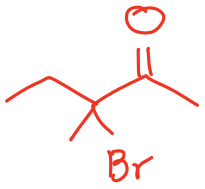
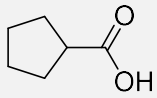
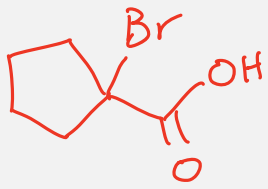
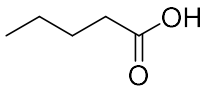
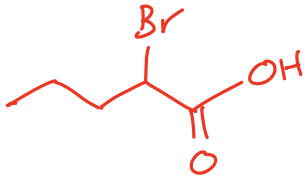
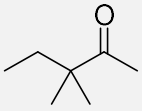
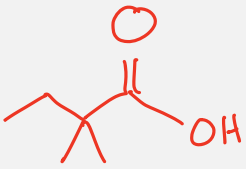
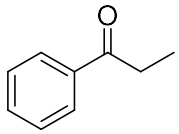
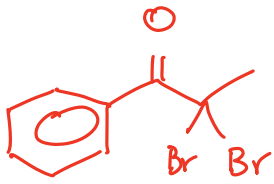
Chapters 21 Worksheet – alpha-Carbon Chemistry

21A. Alpha-Halogenation Products

Draw the major product of each harrowing halogenation reaction: **starting material + reagent → Product.**

	Starting Material	Reagents *& translation* *know this mechanism	Draw the Major Product Pay attention to the amount of reagent added!
1		* **(a)** Br_2, HAc *Molecular **bromine** (1 mol) in **acetic acid***	
2		* **(a)** Br_2, HAc *Molecular **bromine** (1 mol) in **acetic acid***	
3		* **(b)** 1. Br_2, PBr_3; 2. NaOH; 3. H_3O^+ *1. Molecular **bromine** and phosphorous tribromide; 2. sodium **hydroxide**; 3. Aqueous **acid***	
4		* **(b)** 1. Br_2, PBr_3; 2. NaOH; 3. H_3O^+ *1. Molecular **bromine** and phosphorous tribromide; 2. sodium **hydroxide**; 3. Aqueous **acid***	
5		* **(c)** 1. xs Br_2, xs NaOH 2. H_3O^+ *Molecular **bromine** and sodium **hydroxide** (base) followed by aqueous **acid***	
6		* **(c)** 1. xs Br_2, xs NaOH 2. H_3O^+ *Molecular bromine and sodium **hydroxide** (base) followed by aqueous **acid***	

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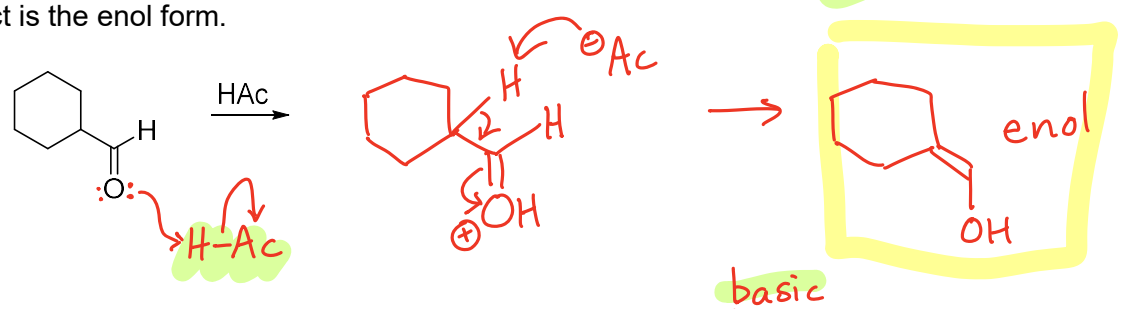
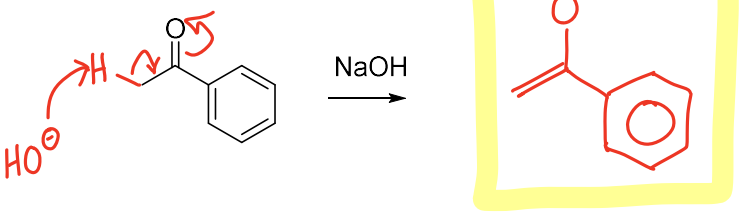
21A. alpha-Halogenation Mechanisms

- Draw the **product** and full arrow-pushing **mechanism** for the following fantastic reactions, including all **charged intermediates**.

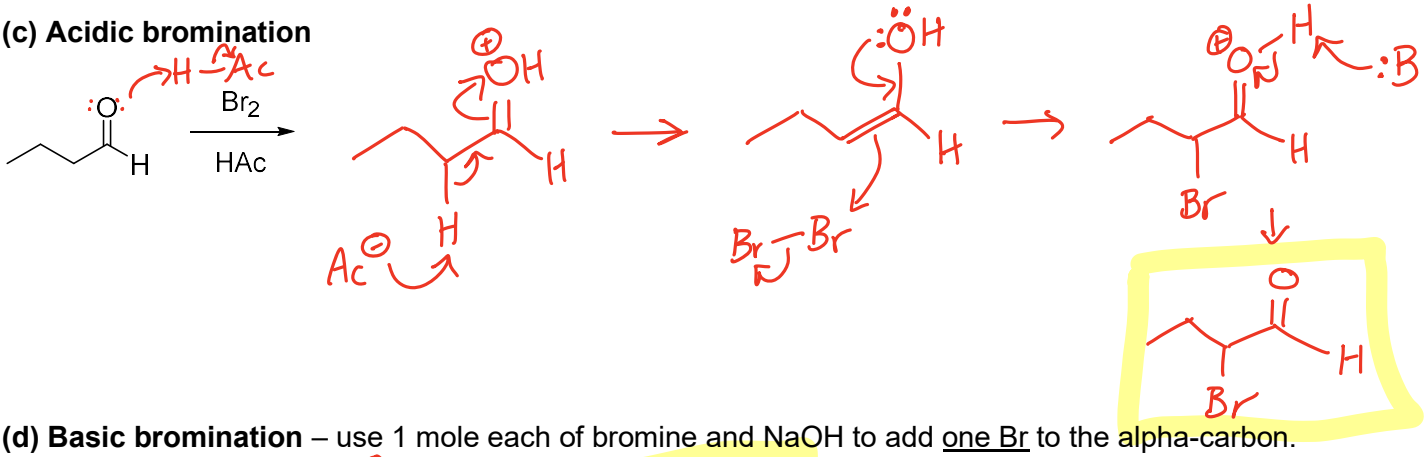
(a) Keto-enol tautomerization – this happens *in the beginning of* any acid alpha-halogenation reaction. The product is the enol form.



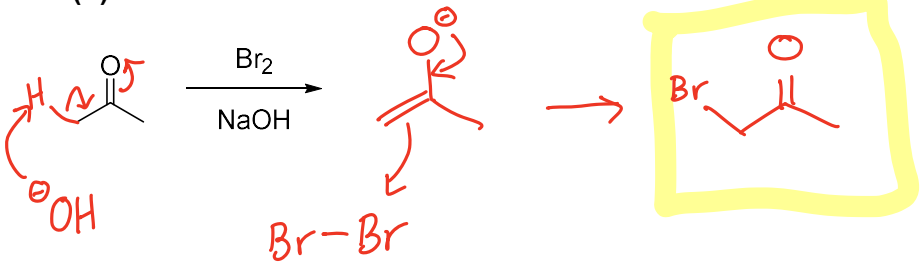
(b) Enolate Formation – this happens *in the beginning of* any acid alpha-halogenation or aldol reaction. The product is an enolate ion.



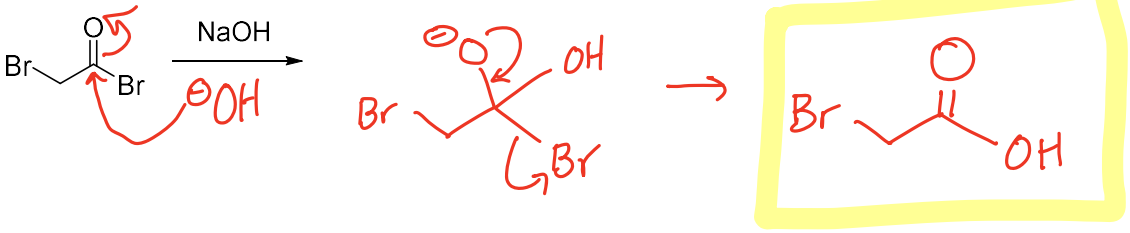
(c) Acidic bromination



(d) Basic bromination – use 1 mole each of bromine and NaOH to add <u>one Br</u> to the alpha-carbon.



(e) Acid bromide hydrolysis – this is the last step of the HVZ reaction.



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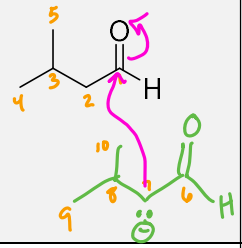
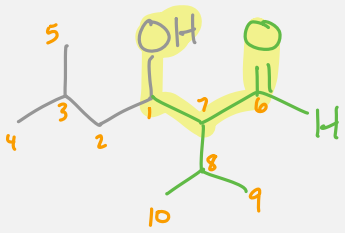
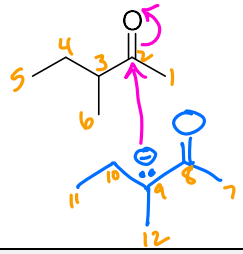
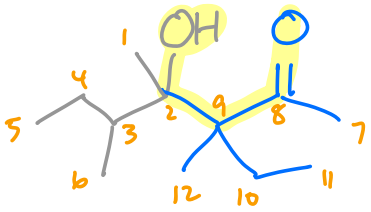
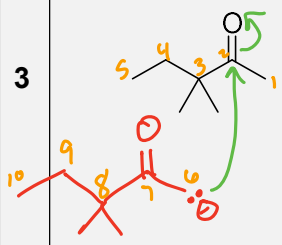
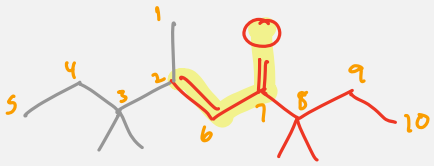
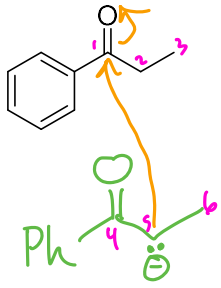
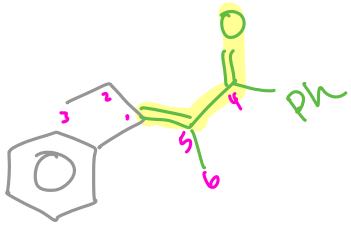
21B. Aldol Reactions

- Draw the major product of each amazing aldol reaction: **starting material + reagent → Product.**

	Starting Material	**Reagents** *& translation* *know this mechanism	**Draw the Major Product** Pay attention to the amount of reagent added!
1		aldol add'n * **(d)** NaOH, H_2O *Sodium **hydroxide** in water*	
2		aldol add'n * **(d)** NaOH, H_2O *Sodium **hydroxide** in water*	
3		aldol + dehydrate **(e)** NaOH, H_2O, Δ heat *Sodium **hydroxide** in water with **heat***	 enone
4		aldol + dehydrate **(e)** NaOH, H_2O, Δ *Sodium **hydroxide** in water with **heat***	 enone

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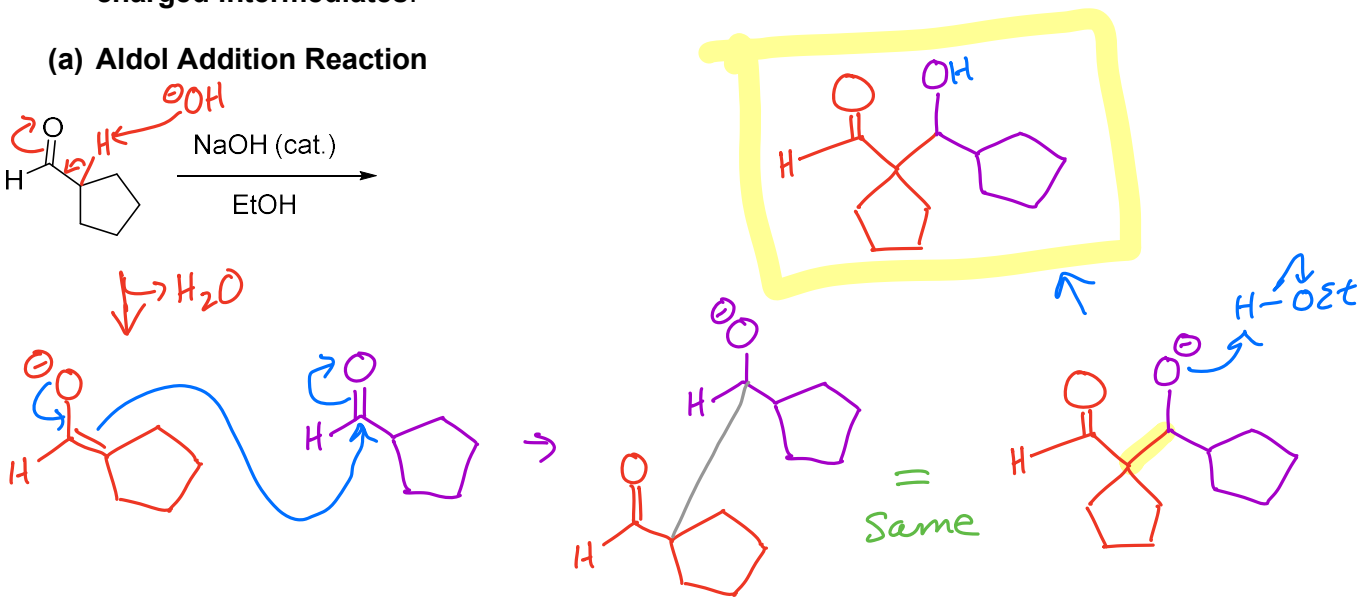
21B. Aldol Reaction Mechanisms

- Draw the **product** and full arrow-pushing **mechanism** for the following aldol reactions, including all **charged intermediates**.

(a) Aldol Addition Reaction



(b) Aldol Condensation Reaction