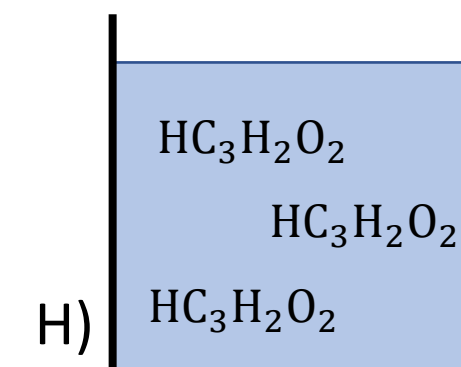
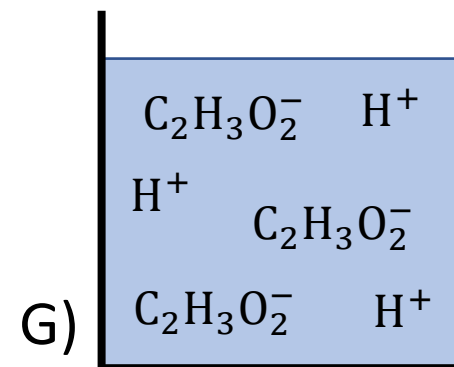
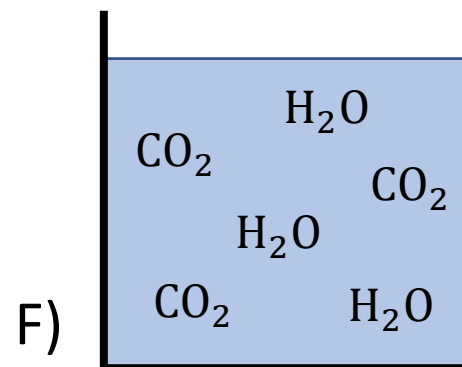
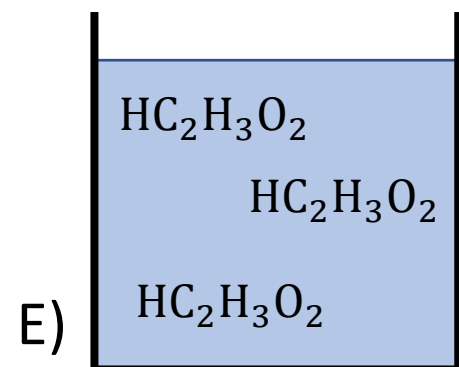
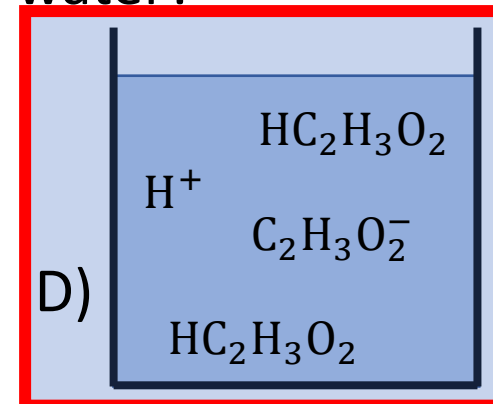
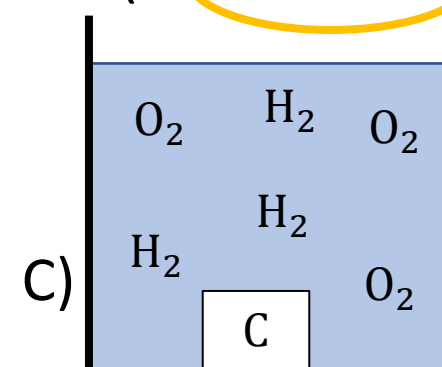
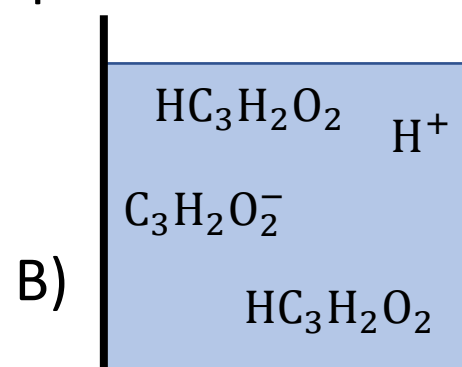
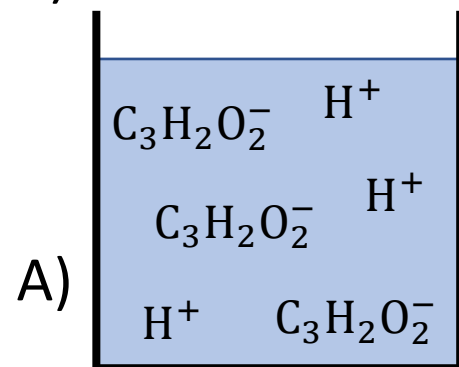


Welcome to our CHEM 4 lecture

Asynchronous review question: Strong and weak acids

1) Which is the best representation of acetic acid (a weak acid) in water?



The next few weeks...

Week 13: November 23 (Monday)	November 25 (Wednesday)	November 27 (Friday)
Before class: Read 7.8 [acid-base reactions] (30 min) PAL worksheets for week 13: A and no PALs	No live lecture today In lieu of lecture: - No new reading, continue with 7.8 [gas forming reactions] - Asynchronous lecture: PowerPoint slides and recording (45 min) - MasteringChemistry: Assign #28a (60 min) [Due: M, 11/30] - Before class on F, 12/11 is the last day to submit late homework for credit. - Prepare for our review session [W, 12/2] and Exam#3 [F, 12/4]. Learning outcomes for Exam #3 - Practice: A, B, C and D (50 min each)	No Class: Thanksgiving Holiday
After class: - Today's PowerPoint slides and recording (45 min) MasteringChemistry #28 (20 min) [Due: M, 11/30] - You have from today until Dec 11 to complete your online CHEM 4 student evaluation. Here is a video explaining the process.		
Week 14: November 30 (Monday)	December 2 (Wednesday)	December 4 (Friday)
Before class: Read 7.9-7.10 [types of reactions] (1 hr) PAL worksheets for week 14: A	Before class: I'll spend the review session answering your questions from Practice Exam #3 (A, B, C and D)	Today in class: Exam #3 (in Canvas) - Learning outcomes for Exam #3 Covers: Cumulative, but stresses material since last exam (6.1-6.9, 3.7, 7.1-7.10). Practice: A, B, C and D (50 min each). (50 min each).
After class: - Today's PowerPoint slides and recording (45 min) MasteringChemistry #29 (50 min) [Due: W, 4/29] - Prepare for our review session [W, 12/2] and Exam#3 [F, 12/4]. - Learning outcomes for Exam #3 - Practice: A, B, C and D (50 min each) - Email Jeff (jparadis@csus.edu) with any practice exam questions you want him to go over during the review session on Wednesday. Priority will be given to questions sent by 12 noon on Tuesday, Dec 1.	After class: - Finish preparing for Exam#3 [F, 12/4]. - Learning outcomes for Exam #3 - Practice: A, B, C and D (50 min each)	After class: - Before class on F, 12/11 is the last day to submit late homework for credit. - You have until Dec 11 to complete your online CHEM 4 student evaluation in Canvas. Here is a video explaining the process.

Asynchronous CHEM 4 lecture

Posted on Wednesday, November 25, 2020

Sec 7.8 continued...

Gas forming reactions

Asynchronous reading question: Gas forming reactions (Sec 7.8)

2) Which of the following gases was not discussed in Section 7.8 as a product of a gas evolving reaction?

A) H_2S

D) SO_2

B) CO_2

E) NH_3

C) NO_2

Background: Gas forming reactions

Gas forming reactions (Table 7.4)

- Certain combinations of reactants give predictable products.
- Be able to apply patterns to new examples.
- All are double displacement reactions (swapping ions, like our precipitation and acid-base neutralization reactions).

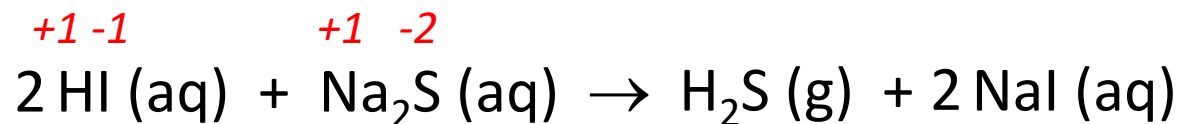
Reactant Type	Intermediate Product	Gas Evolved	Example
+ any acid	sulfides	H_2S	$2 \text{HCl(aq)} + \text{K}_2\text{S(aq)} \longrightarrow \text{H}_2\text{S(g)} + 2 \text{KCl(aq)}$
	carbonates and bicarbonates	CO_2	$2 \text{HCl(aq)} + \text{K}_2\text{CO}_3\text{(aq)} \longrightarrow \text{H}_2\text{O(l)} + \text{CO}_2\text{(g)} + 2 \text{KCl(aq)}$
	sulfites and bisulfites	SO_2	$2 \text{HCl(aq)} + \text{K}_2\text{SO}_3\text{(aq)} \longrightarrow \text{H}_2\text{O(l)} + \text{SO}_2\text{(g)} + 2 \text{KCl(aq)}$
+ any base	ammonium	NH_3	$\text{NH}_4\text{Cl(aq)} + \text{KOH(aq)} \longrightarrow \text{H}_2\text{O(l)} + \text{NH}_3\text{(g)} + \text{KCl(aq)}$

"hydrogen sulfites" (points to sulfites and bisulfites)
 "hydrogen carbonates" (points to carbonates and bicarbonates)

Background: Gas forming reaction #1

#1) Any acid + any sulfide will react to produce H_2S (g)

- Predict products by switching ions, then balance and label states, noting the formation of the (g).
- **Ex:** Write the balanced reaction between aqueous solutions of hydroiodic acid and sodium sulfide.
- **Answer:**



Generic reaction: acid sulfide gas salt from remaining ions

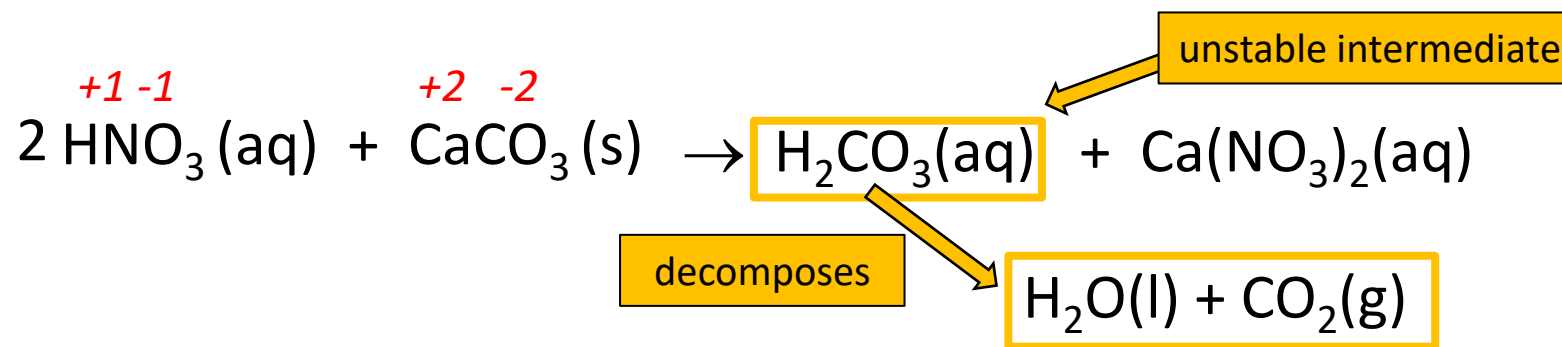
Background: Gas forming reaction #2

#2) Any **acid** + any **carbonate/hydrogen carbonate** will react to produce **CO₂ (g)**

- Predict products by switching ions, then balance and label states, noting the formation of an intermediate from Table 7.4.
- The intermediate is unstable and decomposes to form H₂O(l) and a (g).

Ex: Write the balanced reaction between nitric acid and calcium carbonate.

Answer:



Overall:

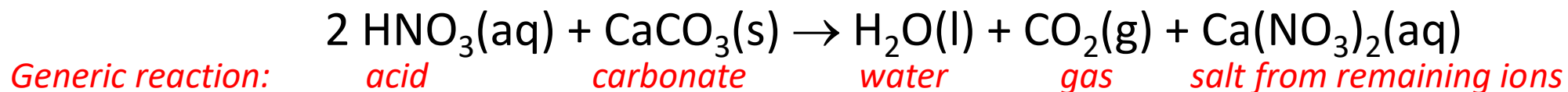


Table 7.4 shows a different acid and carbonate, but the pattern is the same!



Background: Gas forming reaction #3

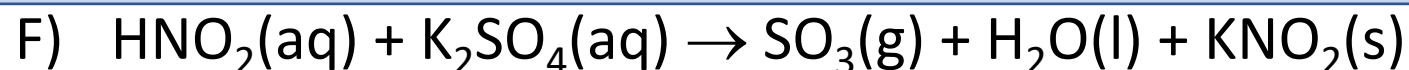
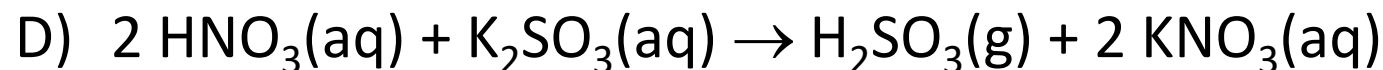
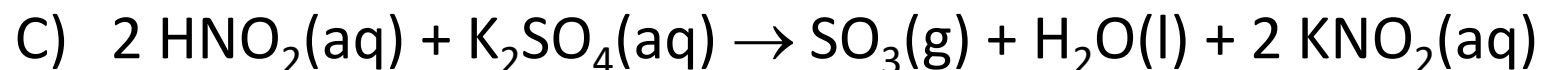
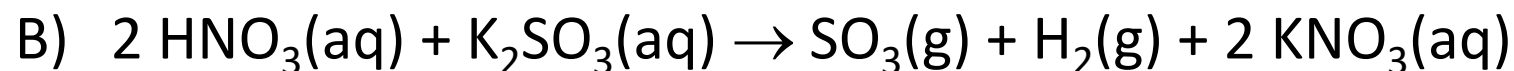
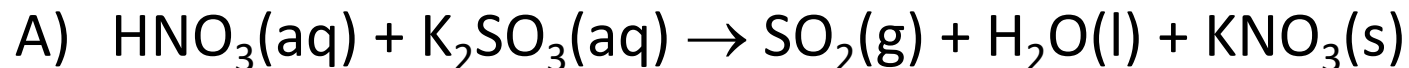
#3) Any acid + any sulfite/hydrogen sulfite will react to produce SO_2 (g)

- Predict products by switching ions, then balance and label states, noting the formation of an intermediate from Table 7.4.
- The intermediate is unstable and decomposes to form $\text{H}_2\text{O}(\text{l})$ and a (g).

See example on next slide...

Asynchronous progress check: Gas forming reactions

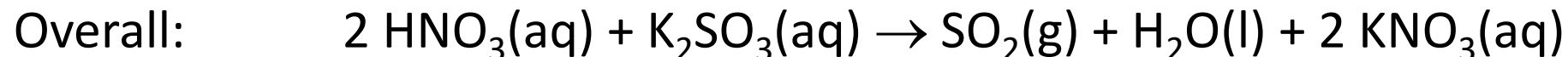
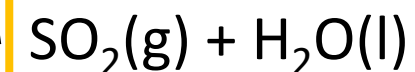
3) Predict the molecular equation for the reaction between nitric acid and potassium sulfite.



Answer:



decomposes



Generic reaction: acid sulfite gas water salt from remaining ions

Asynchronous progress check : Gas forming reactions

4) Which of the following is not expected to react with HI (aq) to form a gas?

A) NaHCO_3

B) Na_2S

C) Na_2CO_3

D) Na_2SO_4

E) Na_2SO_3

F) they will all form gas

TABLE 7.4 Types of Compounds That Undergo Gas Evolution Reactions

Reactant Type	Intermediate Product	Gas Evolved	Example
sulfides	none	H_2S	$2 \text{HCl(aq)} + \text{K}_2\text{S(aq)} \longrightarrow \text{H}_2\text{S(g)} + 2 \text{KCl(aq)}$
carbonates and bicarbonates	H_2CO_3	CO_2	$2 \text{HCl(aq)} + \text{K}_2\text{CO}_3\text{(aq)} \longrightarrow \text{H}_2\text{O(l)} + \text{CO}_2\text{(g)} + 2 \text{KCl(aq)}$
sulfites and bisulfites	H_2SO_3	SO_2	$2 \text{HCl(aq)} + \text{K}_2\text{SO}_3\text{(aq)} \longrightarrow \text{H}_2\text{O(l)} + \text{SO}_2\text{(g)} + 2 \text{KCl(aq)}$
ammonium	NH_4OH	NH_3	$\text{NH}_4\text{Cl(aq)} + \text{KOH(aq)} \longrightarrow \text{H}_2\text{O(l)} + \text{NH}_3\text{(g)} + \text{KCl(aq)}$

+ any
acid

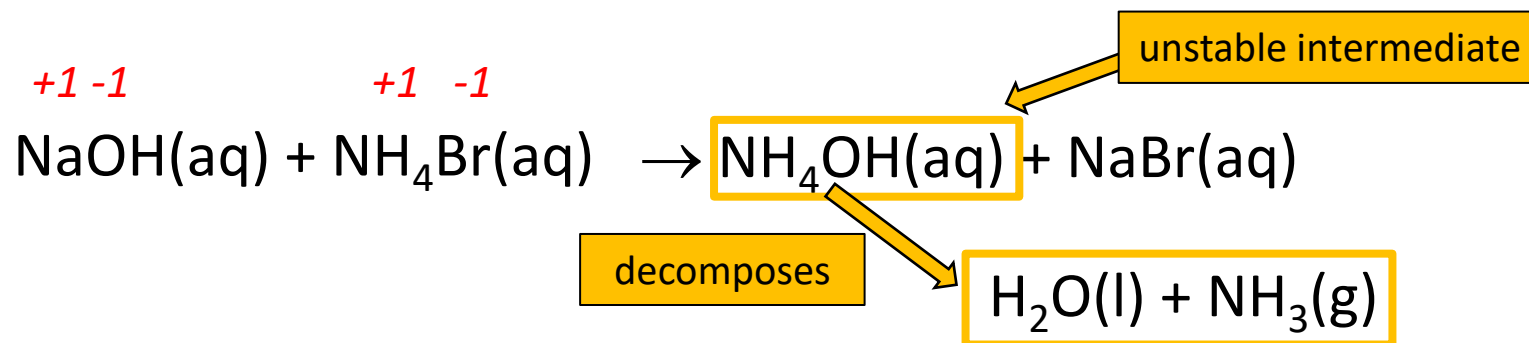
Background: Gas forming reaction #4

#4) Any **base** + any **ammonium salt** will react to produce **NH₃ (g)**

- Predict products by switching ions, then balance and label states, noting the formation of an intermediate from Table 7.4.
- The intermediate is unstable and decomposes to form H₂O(l) and a (g).

Ex: Write the balanced reaction between aqueous solutions of sodium hydroxide and ammonium bromide.

Answer:



Overall:



Generic reaction: **base** **ammonium** **gas** **water** **salt from remaining ions**

Table 7.4 shows a different base and ammonium salt, but the pattern is the same!