

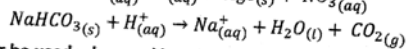
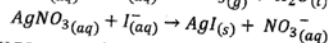
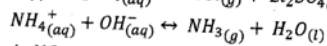
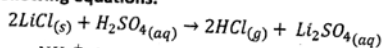
Chemicals in Everyday Life: What Are They and How Do we know?

Pre lab questions

POINTS Available

- 1. Why is it unwise to haphazardly mix household chemicals or other chemicals?**  
*Because household chemicals may appear innocuous, and when they are combined, can sometimes produce severe explosions or other hazardous reactions or dangerous fuming gases.*
- 2. How you could detect the presence of  $\text{NH}_4^+$  ion?**  
*With the addition of a NaOH solution and a piece of wet red litmus paper will turn to blue*
- 3. How you could detect the presence of  $\text{CO}_3^{2-}$  ion?**  
*With the addition of a concentrated  $\text{H}_2\text{SO}_4$ , it will release  $\text{CO}_2$  gas*
- 4. How you could detect the presence of  $\text{Cl}^-$  ion?**  
*With the addition of a  $\text{AgNO}_3$  solution*
- 5. How you could detect the presence of  $\text{SO}_4^{2-}$  ion?**  
*With  $\text{Ba(OH)}_2$  solution*
- 6. How you could detect the presence of  $\text{I}^-$  ion?**  
*With the addition of a  $\text{AgNO}_3$  solution*
- 7. How you could detect the presence of  $\text{Ag}^+$  ion?**  
*With a solution of  $\text{Cl}^-$  or  $\text{I}^-$  ions, it will form a white or yellow precipitate respectively.*

8. Complete and balance the following equations:



9. **Why should distilled water be used when making chemical tests?**  
*Because regular tap water contains ions that can interfere with the qualitative analysis.*
10. **Assume you had a mixture of solid  $\text{Na}_2\text{CO}_3$  and  $\text{NaCl}$ . Could you use only  $\text{H}_2\text{SO}_4$  to determine whether or not  $\text{Na}_2\text{CO}_3$  was present? Explain.**

*No. Both  $\text{Na}_2\text{CO}_3$  and  $\text{NaCl}$  react with  $\text{H}_2\text{SO}_4$  to form gases. The former forms  $\text{CO}_2$  (odorless) and the latter  $\text{HCl}$  (pungent odor). The presence of  $\text{NaCl}$  would thus mask the presence of  $\text{Na}_2\text{CO}_3$ . Another test is necessary to confirm the presence of  $\text{Na}_2\text{CO}_3$ , such allowing the evolved gases react with a  $\text{Ba(OH)}_2$  solution, causing insoluble  $\text{BaCO}_3$  to form.*

*Other possible way could be adding the acid and a wet blue litmus paper turn to red by the presence of  $\text{HCl}$ .*

11. **Assume you had a mixture of solid  $\text{Na}_2\text{CO}_3$  and  $\text{NaCl}$ . How could you show the presence of both carbonate and chloride in this mixture?**

*Treatment of the solid with dilute  $\text{HNO}_3$  would cause effervescence and the formation of  $\text{CO}_2$ . Holding a drop of  $\text{Ba(OH)}_2$  solution above the reaction would confirm  $(\text{CO}_3)^{2-}$  by formation of  $\text{BaCO}_3$  as a precipitate. If  $\text{AgNO}_3$  were added to the  $\text{HNO}_3$  solution,  $\text{AgCl}$  would precipitate.*

12. **How you could show the presence of both iodide and sulfate in a mixture.**

*Divide the mixture into two portions. Treat one portion with concentrated  $\text{H}_2\text{SO}_4$ . Violet vapors of  $\text{I}_2$  would indicate the presence of  $\text{I}^-$ . Dissolve the other portion in water and add  $\text{BaCl}_2$  to precipitate  $\text{BaSO}_4$ .*

## Chemicals in Everyday Life: What Are They and How Do We Know?

### A. Household Ammonia

1. Effect of household ammonia on dry litmus turns the red litmus paper to light blue
2. Effect of household ammonia on moist litmus turns blue (faster)
3. Effect of  $\text{NH}_4\text{Cl}$  on litmus No effect is seen
4. Effect of  $\text{NH}_4\text{Cl} + \text{NaOH}$  on litmus turns red litmus paper to blue
5. Fertilizers contain ammonium salts: Yes \* No
6. Smelling salt Ammonia odor

6  
points  
available

### B. Baking Soda, $\text{NaHCO}_3$

7. Baking soda +  $\text{H}_2\text{SO}_4$  A colorless, odorless gas is produced.
8. Baking soda + vinegar A colorless, odorless gas is produced
9. Chalk contains carbonate ion: Yes \* No

3  
points

### C. Table Salt, $\text{NaCl}$

10. Effect of  $\text{H}_2\text{SO}_4$  on table salt A spicy gas ( $\text{HCl}$ ) is formed, turns moist blue litmus to red.
11.  $\text{H}_2\text{SO}_4(l) + 2\text{NaCl}(s) \rightarrow$   $\text{Na}_2\text{SO}_4(s) + 2\text{HCl}(g)$
12. Effect of  $\text{AgNO}_3$  on table salt White precipitate
13. Why use distilled water? Because regular tap water contains  $\text{Cl}^-$  ions
14. Chloride ions in tap water: Yes \* No
15. Salt in flame Brilliant yellow flame

6  
points

### D. Epsom Salts, $\text{MgSO}_4 \cdot 7\text{H}_2\text{O}$

16. Effect of  $\text{H}_2\text{SO}_4$  on Epsom salts No reaction
17.  $\text{BaCl}_2 + \text{Epsom salts}$  White precipitate  $\text{BaSO}_4$  results.

2  
points

### E. Bleach, $\text{Cl}_2$ Water

18. Bleach +  $\text{NaI}$  A brown color is seen in the water, which becomes purple in mineral oil
19. Silver nitrate +  $\text{NaI}$  A yellow precipitate results.

2 pts

## Report Sheet • Chemicals in Everyday Life: What Are They and How Do We Know?

20. Effect of  $H_2SO_4$  on  $NaI$  The  $NaI$  turns brown;  $HI$  and  $I_2$  are liberated/ Purple color or violet.

## F. Unknown

21. Unknown ion - see table 1 in text book
22. Confirmatory test need to perform a confirmatory test on your unknown.

## QUESTIONS

1. How could you distinguish sodium chloride (table salt) from sodium iodide (a poison)? Show reactions.

Use  $AgNO_3$  solution:  $Ag^+ + Cl^- \rightarrow AgCl(s)$  white /  $Ag^+ + I^- \rightarrow AgI(s)$  yellow

Use  $H_2SO_4$  (conc) on solid  $H_2SO_4 + 2NaCl(s) \rightarrow 2HCl(g) + Na_2SO_4$  (HCl spicy gas)

$H_2SO_4 + NaI(s) \rightarrow NaHSO_4 + HI(g)$

$H_2SO_4 + 8HI \rightarrow H_2S + 4H_2O + 4I_2$  (Solid darkens; purple/violet vapors)

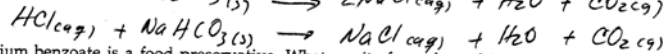
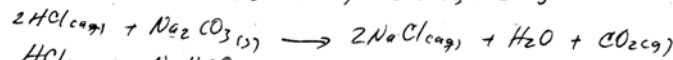
2. How could you distinguish solid barium chloride from solid barium sulfate?

Add concentrated  $H_2SO_4$ . No reaction will occur with  $BaSO_4$ ,  $BaCl_2$  will liberate  $HCl$  that changes blue litmus to red.

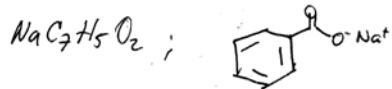
Solubility;  $BaCl_2$  is soluble in water, whereas  $BaSO_4$  is not.

3. Do you think that washing soda,  $Na_2CO_3$ , could be used for the same purpose as baking soda,  $NaHCO_3$ ? Would  $Na_2CO_3$  react with  $HCl$ ? Write the chemical equation for the reaction of  $NaHCO_3$  with  $HCl$ .

It depends. For some purposes, such as neutralizing acids  $HCl$  or  $H_2SO_4$ , but not stomach acids, nor can it readily be used in baking, and it should not to be ingested.  $Na_2CO_3$  will react with  $HCl$ .



4. Sodium benzoate is a food preservative. What are its formula and its solubility in water? (Consult a handbook or the Internet.) Source: *Handbook of Chemistry & Physics*



Aldrich 1M at 20°C.

range vary from 55 - 66 g/100ml other sources.

5. Citric acid is often found in soft drinks. What is its melting point? (Consult a handbook or the Internet.) Source: *Handbook of Chemistry & Physics*

Aldrich 153-159°C

6. p-Phenylenediamine - solid at RT  $140^\circ C$  melting point

8. Acetic acid.  $CH_3CO_2H$  