

the alkali metals; that in all probability CO_2 is not in combination in normal or moderately alkaline urine.

To determine this, the CO_2 in the total urine of 24 hours was estimated after employing, (1) mixed diet, (2) vegetable diet, (3) after injecting large doses of neutral tartrate of sodium.

(1). Mixed diet—Urine acid in reaction.

First day	0.64 gram. CO_2 .	Fourth day	0.56 gram. CO_2 .
Second day	0.49 " "	Fifth day	0.45 " "
Third day	0.60 " "	Sixth day	0.79 " "
Average for each day, 0.588 gram. CO_2 .			

(2). Vegetable diet—Urine strongly alkaline, but did not effervesce on the addition of an acid.

First day	1.20 gram. CO_2 .	}	Average for each day, 1.09 gram. CO_2 .
Second day	1.16 " "		
Third day	0.93 " "		

(3). After injecting neutral tartrate of sodium urine became alkaline, which was in part due to carbonates, as the urine effervesced *slightly* on the addition of acid.

First period 48 hours following "mixed diet":	Gram. $\text{C}_4\text{H}_4\text{Na}_2\text{O}_6$ taken in 24 hours:	Gram. CO_2 in the urine of 24 hours:
First day	10	1.42
Second day	10	1.65
Second period 48 hours following "vegetable diet":		
First day	15	1.30
Second day	15-17	2.67

From our investigations we conclude:

1. Combined CO_2 is not ordinarily a constituent of normal urine.
2. When CO_2 does appear in combination, it is owing to the excessive alkalinity of the blood when it combines with the hydrates of potassium and sodium.
3. Alkalinity of normal urine, unless excessive in degree, is caused by di- or tri-basic phosphates, and normal urates of potassium and sodium.

RESULTS OF ESTIMATION OF CHLORINE IN MINERAL WATERS BY VOLHARD'S PLAN. By SHERMAN DAVIS.

In "Die Untersuchung des Wassers," by Drs. Tierman and Gärtner, page 132, we find directions for the estimation of chlorine in mineral waters. The method given is essentially that of Volhard. It is the object of this

paper to call attention to two points in this process: First, though it has been remarked by previous observers that there is a reaction between the *silver chloride* formed and the ammonium sulphocyanide, is not this reaction sufficient to produce an appreciable error? We here give some observations made, with this point in view.

WITH DISTILLED WATER.

No.	Time	Filtered.	$\frac{1}{10}$ N. Na Cl.	$\frac{1}{10}$ N. Ag. NO ₃	$\frac{1}{10}$ N Am. Sulph.	Ferric Alum.	HNO ₃ (1.2)
	Min.						
1 . . .	5	no	4	1.62	3	3	3
2 . . .	5	"	"	5 $\frac{1}{2}$	1.85	"	"
3 . . .	3	"	"	"	1.70	"	"
4 . . .	2	"	"	"	1.70	"	"
5 . . .	3	"	"	"	1.75	"	"
6 . . .	2	"	"	"	1.65	"	"
7 . . .	1 $\frac{1}{2}$	"	"	"	1.70	"	"
8 . . .	2	"	"	"	1.80	"	"

These data seem to indicate that even though the time be reduced to a minimum, the results are inconsistent and misleading. Now these variations may be eliminated by a process of *filtering*. Introduce a quantity of sodium chloride, say 4cc from a $\frac{1}{10}$ normal solution, into a 200cc graduated flask, add 4cc nitric acid (1.2 sp. gr.), free from *nitrous acid*, and with distilled water at 15° C fill to mark. Mix well. When the silver chloride has been separated, filter off 100cc of the fluid through a *dry filter*. Introduce the filtrate into a titrating flask, add 2—3cc sat. sol. ferric alum and titrate with the $\frac{1}{10}$ nor. sol. am. sulphocyanide, till the addition of one drop causes a light brown color to appear. This color once produced will be permanent. The results of such a device are shown by the following data:

No.	Time	Filtered.	$\frac{1}{10}$ N Na Cl.	$\frac{1}{10}$ N Ag. NO ₃	$\frac{1}{10}$ N Am. Sulph.	Ferric Alum.	HNO ₃ (1.2)
1 . . .		yes	4cc	7cc	1.55	3	3
2 . . .		"	"	"	1.50	"	"
3 . . .		"	"	"	"	"	"
4 . . .		"	"	"	"	"	"
5 . . .		"	"	"	"	"	"
6 . . .		"	"	"	"	"	"
7 . . .		"	"	"	"	"	"
8 . . .		"	"	"	"	"	"

These results agree with the quantities introduced and are constant. This device was employed in estimating the chlorine in the waters from West

Baden, French Lick, Mt. Aris, Indian and Trinity Springs. The results were *constant* and *accurate*. It also holds in waters containing much mineral matter and organic matter to 350 parts in 100,000.

Second. Will there, without filtering, be an appreciable error? We produce the following data:

WITH DISTILLED WATER.

No.	Time.	$\frac{1}{10}$ N Na Cl.	$\frac{1}{10}$ N Ag. NO ₃	$\frac{1}{10}$ Am. Sulph.	Ferric Alum	HNO ₃ (1.2)
1 . . .	1	3cc	3.5cc	.78cc	3	3
2 . . .	5	5	3.5	.75	"	"
3 . . .	10	3	3.5	.75	"	"
4 . . .	12	"	"	.82	"	"
5 . . .	10	"	"	.75	"	"
6 . . .	10	6	6.5	1.00	"	"
7 . . .	10	6	6.5	.88	"	"
8 . . .	10	"	"	1.00	"	"

We differed from the authors in this—that the solution was *gently* agitated until the color no longer disappeared. With such a standard the error may reach 1.77 pts. in 100,000 pts. as shown by the eighth titration. The observations justify the following inferences:

First. There is an appreciable reaction between the silver chloride and the ammonium sulphocyanide.

Second. The error varies directly with the quantity of chlorine present, and the time employed.

Third. When the reaction of chlorine upon silver nitrate is effected in the presence of ammonium sulphocyanide, the results are inconstant.

Fourth. That it is necessary to filter off the silver chloride, before adding the ferric salt.

Fifth. That by filtering the results are *very* accurate.

Sixth. That if the solution, unfiltered, be allowed to stand ten minutes, the reactions which take place, will produce very appreciable errors.

SOME SUGGESTIONS TO TEACHERS OF SCIENCE OR MATHEMATICS IN HIGH SCHOOLS.

By THOS. C. VAN NUYS.

It is the purpose of the writer to endeavor to indicate, as briefly as practicable, the spirit which should influence teachers of science or mathematics in high schools.

It is needless to state in this connection that the spirit, in which a teacher