RELATION OF PHOSPHORIC ACID TO NITROGEN IN URINE.

By W. ZULZER.

THE author finds that the amount of phosphoric acid emitted in urine does not, as is generally supposed, bear a constant proportion to the nitrogen. From his own and others' researches, it appears that in the case of dogs and cats fed on pure fish, the relation of nitrogen to phosphoric acid is, on the average, 100 : 10.4—12.8. With addition of fat to the diet, 100 : 9.2—11.9. When the animal is fed on flesh, after previous starvation, 100 : 6.6—9.6; with potatoes, the phosphoric acid is 22.5—29.7 per cent. of the nitrogen; with bread, 21.6—29.7 per cent.; with potatoes and fat, 30.8—37.3 per cent.; with calves' brains, 21.7 per cent. After abstinence from food, the proportion of phosphoric acid decreases for 1 or 2 days, and then gradually rises for 6 to 11 days, again slightly decreases, as in the case of a diet of animal food. Shortly before death, the amount again increases. With man, the usual proportion is 17—20 per cent. In the forenoon the ratio is higher than in the afternoon or night. Children have a much greater proportion than older people. The greatest observed amount was 58.5 per cent., and the smallest, 8.7 per cent. In old age, the phosphoric acid increases slightly. After reference to the proportion in cases of disease, the author comes to the conclusion that the variation of proportion is related to the change of matter in the nerves, and that in general, the change of material of the flesh depends on the nervous activity.—*Chem. Centr.*

DECOMPOSITION OF CRYSTALLIZED POTASH-ALUM AT 100°.

By ALEX. NAUMANN.

THE author finds that crystallized potash-alum gradually undergoes dissociation when heated to 100° in sealed tubes. The fused substance first gives off water of crystallization, and deposits a solid compound (probably anhydrous alum), after which there is formed in the liquid a basic compound of alumina, potash, sulphuric acid, and water, corresponding with that formed in alum solutions heated to 100°, as formerly described by the author.

In one experiment 15 grams of freshly crystallized air-dried alum was sealed up in a glass tube and placed in boiling water, when the alum melted to a perfectly clear liquid. In three hours a distinct turbidity appeared, and in five hours the liquid became quite opaque from separation of an apparently amorphous solid, which at the end of four days had settled down, leaving the supernatant liquid clear. At the same time crystalline laminae were formed on the sides of the tube.

The deposited solid (weighing 8.5 grams), when treated with cold water, left 6 per cent. of insoluble residue (basic compound). The soluble portion was found to contain sulphuric acid, alumina, and potash in the same proportions as crystallized alum, as was also the case with the liquid contents of the tube.—*Deut. Chem. Ges.*

PURE MANGANESE CHLORIDE FROM CHLORINE RESIDUES.

By A. PIZZIL.

THE clear liquid is boiled with granulated zinc until the ferric chloride is reduced and the iron precipitated in the metallic state together with any nickel that may be present. The liquid is filtered, sodium acetate and some acetic acid added, and the zinc, lead, and copper precipitated by hydrogen sulphide. On adding ammonium sulphide to the filtrate the manganese and cobalt are thrown down as sulphides: this precipitate after being thoroughly washed is treated with hydrochloric acid, which dissolves the manganese and leaves the cobalt. The solution of pure manganese chloride thus obtained yields pure manganese carbonate, and from this the other salts of manganese may be prepared.—*Gazzetta Chimica Italiana.*

NITRIC ACID AND ITS SALTS.

By DR. ADOLPH GEYGER, of Berlin.

EVEN at the commencement of the present century a part of the saltpetre consumed in the various countries of Europe came from India as so-called exotic saltpetre, and the rest of the supply was obtained as native saltpetre by the lixiviation of natural or artificial nitre beds.

The consumption of nitrates in the chemical arts and in the manufacture of gunpowder and of other blasting materials has increased to such an extent that the earlier sources became utterly insufficient. A new supply was laid open in the vast deposit of a mineral very rich in nitrate of soda, discovered more than fifty years ago in the district of Tampa, on the border between Chili and Peru. The extraction of this deposit is still on the increase and furnishes by far the largest part of the raw material for the nitrates now used in the arts.

According to the statements of Dr. G. Langbein, there were in the year 1871 in the Peruvian nitre districts eleven large refineries with a daily production of about 6,000 cwts. purified nitrate of soda. The nitiferous mineral, called *caliche*, is found in beds from 0.25 to 1.5 metre in thickness, which, however, rarely arise to the surface. The superincumbent rock, *costra*, is from $\frac{1}{2}$ to 2 metres in thickness, and consists principally of a hard conglomerate of sand, felspar, phosphates, and other minerals. The composition of the *caliche* fluctuates; it contains 48 to 75 per cent nitrate of soda, 20 to 40 chloride of sodium, and varying quantities of sulphates of soda and lime, nitrate and iodate of potassa, chloride of magnesium, etc., as also insoluble earthy matters and organic substances (guano). It is first broken up in a disintegrator and placed in the dissolving pans. Some of the establishments use long four-sided cisterns, but the better arranged works use closed egg-shaped boilers provided with two movable covers, of which the upper serves for the introduction of the *caliche*, and the lower for the removal of the exhausted material. The mass rests upon a perforated false floor fixed at about one-fourth the height of the boiler, and consisting of four pieces movable on hinges. The boilers are filled up to the top with the broken raw material, and up to half height with mother-liquor, and are heated by the direct action of steam, which is admitted by four pipes reaching below the false bottom. In from one and a quarter to two and a half hours the liquid is sufficiently saturated with nitre and is let off into settling tanks; after some hours' rest the clear liquid flows into flat crystallizers fixed in an open place and exposed to the wind. Latterly a second settling tank has been interpolated, in which the liquid is al-

lowed to remain for about half an hour, in order to deposit the common salt which is held in mechanical suspension before being run into the crystallizers.

The residue left in the boilers, which still contains from 15 to 35 per cent soda saltpetre, is either cleared out at once or extracted once more with spring water. The closed boilers are simply emptied by letting down the lower or true bottom, when the residue falls into wagons run in beneath, and is drawn away from the works. The crystals of nitre which form in the crystallizing pans after the mother-liquid is drained away are spread upon a large surface exposed to the wind, and called *cencha*, in layers of from 30 to 50 centimetres in thickness, and dried by being frequently turned over. The total cost of 1 cwt. of Chilean saltpetre up to its conveyance to Europe was calculated in the year 1871 by Langbein, as follows:

Cost of production.....	3.25 marks.
Conveyance to the coast	2.40 "
Cost of shipping	0.25 "
Freight to Europe.....	2.75 "
Charges on arrival.....	0.25 "
	8.90 "

or about 8s. 8d.

W. Lloyd, in 1868, calculated the cost of production at 8.40 marks per cwt. The rise of price in spite of the improvements in the process of purification is due to the enormous increase in the cost of labor and in the freight to the Port Iquique. Although the saltpetre districts have been now for some years connected with the port by a railway, the greatest part of the produce is still conveyed upon mules.

The exportation of nitre is still constantly on the increase, as the following figures prove:

1830.....	18,700 cwts.
1835.....	140,399 "
1840.....	227,362 "
1850.....	511,845 "
1860.....	1,370,248 "
1870.....	2,943,413 "
1871.....	3,605,906 "
1872.....	Upwards of 4 million cwts.

By the decree of July 12th, 1873, the Peruvian Government has taken the saltpetre trade into its own hands, and has fixed the quantity that may be yearly exported at $4\frac{1}{2}$ million cwts. As to the effect of this monopoly upon the saltpetre trade, no decision can as yet be formed.

As a specimen of the composition of the purified soda saltpetre, as imported into Europe, the following very complete analysis, published by Wagner, may be cited:

Sodium nitrate.....	94.03
" nitrite	0.31
" chloride.....	1.52
" sulphate	0.92
" iodate	0.29
Potassium chloride	0.64
Magnesium chloride.....	0.93
Boric acid.....	trace
Moisture.....	1.36
	100.00

The mother-liquor of the refineries contains from $2\frac{1}{2}$ to 5 grms. iodine per litre, and is used in some Peruvian establishments as a source of that body.

As to the origin of these saltpetre beds in Peru, various explorers have published their opinions, but without giving a fully satisfactory explanation. Indeed it would almost seem as if the formation had taken place under circumstances which have remained hitherto unknown. According to H. Reck, Chili saltpetre is the oxidation product of large guano beds whereby, however, as Nöllner very justly remarks, it remains unexplained what can have come of the great mass of sparingly soluble phosphate of lime, while the readily soluble nitrate of soda remains behind.

CHEMICAL REAGENTS.

By MALVERN W. ILES.

ALTHOUGH it is generally conceded by chemists that reagents should be pure, yet too often, I am convinced, is this subject disregarded even by competent analysts.

Many discrepancies can, I think, be traced to this source, for if the very tools which the chemist uses to make the elements respond to his inquiries are defective, then his responses must inevitably be more or less erroneous.

It has been a subject of note with what extreme care the analyst determines the ash of filter papers, even to a very small fraction of a milligramme, yet entirely disregards the fact that his reagents may be contaminated with phosphoric and sulphuric acids, also soda, potash, etc.

In the analysis of an iron ore in which a determination of phosphorus and sulphur is required, it is of the most vital importance that the chemical reagents used should be absolutely free from sulphuric acids.

Prof. Albert Leeds read a paper before the New York Academy of Sciences, in which he mentions the wide distribution of phosphoric acid in nature, having found it in a number of substances in which it was little expected.

The scientific metallurgists have of late years greatly improved the quality of their iron and steel, by securing flux, fuel and building material, containing a minimum of sulphur and phosphorus. Should not the chemist who lays claim to accuracy be equally careful in respect to his results? To illustrate this point, W. H. Greenwood states that "sulphur and phosphorus are the great enemies of good steel; 0.2 per cent. of sulphur renders the metal brittle and red short, while 0.1 per cent. of phosphorus is objectionable, as tending to render it cold short and unworkable at ordinary temperatures." We can easily see what great mischief would be caused by an incorrect analysis under such circumstances.

Fresenius states that we should make it an invariable rule to test the purity of our reagents before we use them, no matter whether they be articles of our own preparation or from other makers.

If this excellent advice were placed in the form of a question to many an analyst, I imagine it would be a source of embarrassment. Nor could a satisfactory excuse be given by stating that all their chemicals were labeled *chemically pure* (C. P.)

I have frequently found chemicals upon which the letters C. P. occupied a most conspicuous place, which upon qualitative analysis showed large percentages of impurities. I therefore look with suspicion upon every chemical labeled *chemically pure*, and regard it generally as a trick of the

manufacturers to obtain a higher price for their goods than they really deserve.

In order that I may not be mistaken, I will state, I believe there are conscientious manufacturing chemists who greatly promote chemical science by the care and intelligent labor they give to their chemicals.

It is not my intention to give a systematic treatise upon chemical reagents; but simply a brief statement of the impurities detected in reagents used in the Qualitative Laboratory of the School of Mines, which it is thought will be a fair representative of chemicals used in laboratories; since the reagents examined are both from American and foreign manufacturers.

The enumeration of the impurities detected will, it is hoped, be of more or less interest to the manufacturing chemist, the analyst, and the pharmacist.

IMPURITIES DETECTED.

Ammonium Hydrate.—From C. K. Kraft, marked C. P., is quite pure; it however contains a trace of alumina and some carbonic acid, probably from the atmosphere.

Ammonium Acetate and Carbonate were found to contain traces of chlorine.

Ammonium Chloride.—From E. Merck, Darmstadt (labeled C. P.)—I found a large quantity of dirt, chips, etc. A trace of sulphuric acid was also detected. By filtration a fair article is obtained.

Ammonia Iron Alum (bought for C. P.) contains a trace of manganese, lime and an appreciable amount of chloride.

Ammonium Sulphate (from E. Merck) contains a very large amount of chlorine, a trace of nitric acid, and considerable soda.

Arsenic Salts are very liable to contain both the *ous* and *ic* acids.

Barium Carbonate.—I examined a number of samples of this salt, and found it remarkably impure. Since in the Qualitative Laboratory it is constantly used, grave errors might easily arise from its use. I find, besides some barium carbonate, the following impurities: Phosphoric, hydrochloric and silicic acids; alumina, lime, magnesia (trace), manganese (trace), large amount of soda, and a very large amount of barium sulphate.

Barium Chloride.—The sediment from this salt was found to contain potash, lime, alumina, carbonic, silicic and sulphuric acids; considerable organic matter was detected. Even with the above mentioned impurities, the salt is sufficiently pure for qualitative purposes, since it is almost exclusively used for the detection of sulphuric acid.

Barium Nitrate.—E. Merck's article contains an appreciable quantity of barium sulphate. Charles T. White's barium nitrate contains no barium sulphate; the salt was found to be very pure.

Calcium Chloride contains some carbonic and sulphuric acids, also a small amount of calcium hydrate.

Chromic Alum contains a little iron and alumina; also silicic acid.

Hydrochloric Acid (from C. K. Kraft, labeled C. P.)—Generally contains a minute trace of iron and arsenic.

Hydro-di-sodic Phosphate contains quite an appreciable amount of sulphuric acid, a trace of hydrochloric, and also silicic acid, and some alumina. (From E. Merck, labeled C. P.)

Magnesium Sulphate contains a trace of nitric acid. (From E. Merck, bought for C. P.)

Nitric Acid (from C. K. Kraft, C. P.), sometimes contains a trace of iron, otherwise very pure.

Lead Acetate contains some iron, hydrochloric and sulphuric acids.

Minium contains zinc.

Potassium Antimonate (from E. Merck), contains a very large quantity of potassium carbonate.

Potassium Oxalate contains a very large quantity of sulphuric acid. (From E. Merck, bought for C. P.)

Potassium Hydrate (commercial), comes in a liquid form from C. K. Kraft; the sediment contains considerable alumina, a trace of manganese, iron, lime, silicic, carbonic and hydrochloric acids. (Commercial article, not labeled C. P.)

Stick Potassa, from Powers & Weightman, contains a remarkably large quantity of potassium chloride, considerable alumina, and of course, some carbonic acid, which it absorbs from the air. E. Merck's stick potassa is quite pure; it contains, however, a trace of alumina.

Potassium Sulphate contains alumina, sulphuric acid and organic matter.

Sodium Acetate contains a trace of chlorine.

Sodium Carbonate.—E. Merck's dry anhydrous sodium carbonate is generally very pure; it, however, frequently contains a minute trace of sulphuric and hydrochloric acids. Some samples are entirely free from sulphur.

Sulphuric Acid (common) comes from C. K. Kraft, contains iron and lead, very rarely contains nitric acid or oxides of nitrogen.

Sheet Zinc contains considerable lead. Granulated Belgian zinc contains a trace of iron. New Jersey and Lehigh zinc is nearly chemically pure, contains only a trace of iron, and occasionally arsenic in minute quantities.

SEPARATION OF SAL-AMMONIAC IN URINE.

By C. VORT.

A KNOWN quantity of sal-ammoniac was administered to a dog which had fasted for some days. The amount of urea found in the urine increased considerably; nevertheless experiment showed that the greater part of the ammonia originally administered as sal-ammoniac passed through the body unchanged. The increase in secretion of urea cannot therefore be traced to the synthesis of that compound from the sal-ammoniac administered. The author is disposed to regard the action of sal-ammoniac as comparable with that of sodium chloride, viz., as promoting decomposition of albuminoid substances in the organism.—*N. Rep. Pharm.*

MODIFICATIONS OF ANIMAL FATS.

By H. C. BARTLETT.

THE analysis of a large number of pancreatic glands, taken from pigs, dogs, calves, and other animals, showed that the fatty components of most of the glands contained considerable proportion of volatile fatty acids combined with glycerin. These are, perhaps, not true synthetical productions of the glycerides, but compounds of soluble