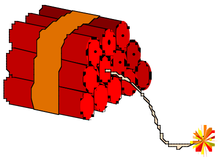

SEKTIONEN FÖR DETONIK OCH
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NEWSLETTER 3/2018

2018-11-30

Fredsteknik/Peace Technology

Editor: Hans Wallin

Secretary-General Dag Hammarskjöld viewed disarmament as a dynamic process that was continually evolving in response to events and the interaction among States. He once said, “in this field, as we well know, a standstill does not exist; if you do not go forward, you do go backward”. In this spirit, we appeal to all to use every opportunity to carry forward momentum for disarmament where it exists, and to generate new impetus where it is needed, in order to achieve a safer and more secure world for all.

Other words spoken in this matter are these by Izumi Nakamitsu, High Representative and Under-Secretary-General for Disarmament Affairs.

1. SECURING OUR COMMON FUTURE

António Guterres, United Nations Secretary-General, has released *An Agenda for Disarmament*:

“International security is at risk. Cold war tensions have returned. Global military spending is at its highest since the fall of the Berlin Wall. This is why I am launching my disarmament agenda, based on concrete, practical actions.” The document is very important and interesting, download at https://www.un.org/disarmament/sg-agenda/en/

2. Critical Path Guide to the IATG

Inadequately managed ammunition poses serious security and humanitarian risks. Potential for unintended explosion and diversion to the illicit market exponentially increases when the security of stockpile diminishes. As a corollary, effective physical security and stockpile management prevents unwanted diversion to illicit markets, including non-State armed groups, terrorists and transnational criminal organizations. For these groups, ammunition with a high explosive quality is particularly attractive for the manufacture of improvised explosive devices. In addition to mitigating security breaches, the safe and secure management of ammunition also prevents humanitarian disasters, including death, injury and displacement that result from explosions at munitions sites.

These efforts are pursued in the broader context of the Sustainable Development Goals, in particular Goal 16 on peace, justice and strong institutions and its target related to a significant reduction in illicit arms flows. States have critically recognized that there can be no deve-

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lopment without security and safety. Moreover, addressing poorly-managed ammunition stockpiles constitutes a key component of the Secretary-General's agenda for disarmament, *Securing Our Common Future*. The Secretary-General has prioritized "disarmament that saves lives" and views attention to ammunition management as a concrete activity in realizing this pillar of his agenda.

This Guide is published in support of IATG users in understanding how the measures within the IATG are to be interpreted and applied in practice. It explains technical concepts and processes in a *simple*, *clear*, and *concise* manner.

While ammunition management is a highly-technical endeavour that may, on the surface, be of interest to a small sub-set of technical experts, its consequences are much broader and deserve consistent and dedicated attention. The hope is that this Guide will support users in navigating the principles, methodology and technical content of the IATG with the ultimate goal of "saving lives".

3. Illegal och fullständigt hämningslös användning av handgranater – ett aktuellt exempel/Illegal and completely unrestrained use of hand grenades – a current example

Dan Loyd

Serbian hand grenade M 75.

Under sommaren 2018 inträffade tyvärr en av de tänkbara händelser som diskuterades i den tidigare artikeln om handgranater, vilken var införd i Newsletter 2/2018. I slutet av juli kastade en hittills okänd person in en handgranat genom ett öppet fönster i en lägenhet, som ligger i en av Stockholms södra förorter. Handgranaten var osäkrad och den borde därför ha exploderat efter några sekunder, men det gjorde den lyckligtvis inte. Lägenhetsinnehavaren upptäckte granaten, men han rörde den inte utan tillkallade polisen, vars bombtekniker tog hand om handgranaten.

Det fanns ingen känd hotbild mot familjen som bor i lägenheten. Familjen var inte heller

During the summer of 2018, one of the possible events discussed in the previous article on hand grenades was published in Newsletter 2/2018. At the end of July an unknown person threw a hand grenade through an open window into an apartment, located in one of Stockholm's southern suburbs. The pin of the hand grenade was pulled out and should have exploded after a few seconds, but fortunately it did not. The apartment owner discovered the grenade, but he did not touch it but called the police, whose bomb technician took care of the hand grenade.

There was no known threat to the family living in the apartment. Also, the family was känd hos polisen. Handgranaten kan därför av misstag ha kastats in genom fel fönster. Det är nämligen inte helt lätt att utifrån ett hus avgöra vilka fönster som tillhör en viss lägenhet. Om handgranaten hade exploderat kunde i detta fall oskyldiga människor i lägenheten ha skadats eller dödats.

Händelsen är ett exempel på hur enskilda kriminella personer eller kriminella grupper använder handgranater för att bekämpa andra personer eller grupper. Användningen av handgranater som vapen kan bero på att det finns gott om handgranater på den illegala marknaden i Sverige och att de är både billigare och enklare att anskaffa än skjutvapen. Den goda tillgången på handgranater beror på att det är förhållandevis enkelt att smuggla in dem till Sverige. Granaterna kommer främst från dåligt eller obefintligt bevakade förråd i de forna europeiska öststaterna.

Orsaken till att granaten inte exploderade kan vara att det var en gammal handgranat från en tidigare öststat. De flesta handgranater som smugglas in till Sverige idag kommer från det forna Jugoslavien, som upplöstes 1991. Dessa gamla granater har en förhållandevis liten mängd sprängämne (30–50 gram) och verkansdelen består av små stålkulor. Åldern och olämplig förvaring gör att andelen defekta enheter bland dessa gamla granater är stor. Vanligtvis är det korrosion som gör att utlösningsmekanismen kärvar och inte fungerar. Det är tyvärr inte ovanligt att den kärvande mekanismen hos en osäkrad granat börjar fungerar igen, när man vidrör granaten. Detta gör att det är mycket farligt för bombtekniker att ta hand om och desarmera eller destruera en sådan granat.

Den aktuella händelsen är med stor sannolikhet inte den sista händelsen av den här typen som vi kommer att se i Sverige. Tyvärr är det inte så mycket vi som privatperson kan göra åt saken. I kriminella kretsar är handgranater fortfarande ett billigt och effektivt vapen som det är lätt att få tag på. Detta kommer troligen att gälla många år framöver.

Färre kriminella grupper i samhället minskar naturligtvis användningen av handgranater. Det är emellertid en politisk fråga att minska antalet kriminella personer och det kommer att ta lång tid att lösa det problemet. Det

not known to the police. The hand grenade can therefore be mistakenly thrown through the wrong window. It is not that easy to know which window in a big building that belongs to a particular apartment. Had the hand grenade exploded, innocent people in the apartment could have been injured or killed in this case.

This event is an example of how individual criminals or criminal groups use hand grenades to fight other people or groups. The use of hand grenades as weapons may be due to the fact that there are plenty of hand grenades in the illegal market in Sweden and that they are both cheaper and easier to get hold of than firearms. Hand grenades are easy of access because it is relatively easy to smuggle them into Sweden. The grenades come mainly from poorly or insufficiently guarded stores in the former European eastern states.

The reason that the grenade did not explode may be that it was an old one from such a state. Today, most hand grenades smuggled into Sweden come from the former Yugoslavia, which was dissolved in 1991. These old grenades have a relatively small amount of explosives (30-50 grams) and the action part consists of small steel balls. Age and unsuitable storage means that the proportion of defective units among these old grenades is high. Usually, it is corrosion that causes the trigger mechanism to bind and not work. Unfortunately, it is not unusual that the binding mechanism of an unsecured grenade begins to work again when touching the grenade. This makes it very dangerous for bomb technicians to take care of and disarm or destroy such a grenade.

Most likely, the current event is not the last of this kind that we will see in Sweden. Unfortunately, it is not much we as private individuals can do about it. In criminal circles, hand grenades are still cheap and efficient weapons easy to get hold of. This will likely be so for many years to come.

Fewer criminal groups in the society will naturally reduce the use of hand grenades. However, it is a political issue to reduce the number of criminals and it will take a long time to solve the problem. It is also not easy to reduce the availability of hand grenades in är inte heller helt lätt att minska tillgången på handgranater i Sverige. Det är fortfarande förhållandevis enkelt att smuggla in handgranater till Sverige och tillgången utomlands i exempelvis det forna Jugoslavien är än så länge mycket god. Mängden insmugglade granater kan minskas om tullen tillförs mer resurser, men även detta är en politisk fråga.

En skärpning av straffsatserna skulle kunna vara en väg att visa samhällets syn på insmuggling och användning av handgranater. En ökad kunskap hos allmänheten om handgranater och hantering av dem är också nödvändig för att minska risken för att oskyldiga personer skadas eller dödas av misstag.

Sweden. It is still relatively easy to smuggle hand grenades into Sweden and access abroad in, for example, former Yugoslavia is abundant. The amount of grenades smuggled into Sweden can be reduced if the Customs are given more resources, but this is also a political issue.

Strengthening the penalty rates could be a way of showing society's view of smuggling and use of hand grenades. Increasing public awareness about hand grenades and handling them is also necessary to reduce the risk of injuries or inadvertently injured.

4. Small Arms Survey

The Small Arms Survey organisation, Geneva, has issued a handbook for identifying small arms and light weapons, and tracking their proliferation. It is titled *Identification of Small Arms, Light weapons, and Associated Ammunition.* Edited by N. R. Jenzen-Jones and Matt Schroeder, November 2018.

They write:

"Arms and ammunition are evidence. Many weapons carry marks that, combined with their physical characteristics, reveal important information about them, including their manufacturer, age, and origin. This information, in turn, provides vital clues about the sources and flows of weapons in the area in which they were found.

The goal of this Handbook is to provide the reader with a basic understanding of how to identify and analyse small arms and light weapons, and to track their proliferation. The process of identifying arms is complex, and no single guide can provide all of the information required to identify every weapon or round of ammunition that may be encountered at crime scenes or in conflict zones. Instead, this guide explains the process by which weapons and ammunition are identified and arms flows are tracked. Reference material on specific small arms, light weapons, and ammunition is included throughout the guide. This material will help readers to take the steps necessary to identify the make and model of the most commonly encountered weapons and ammunition."

Download *An Introductory Guide to the Identification of Small Arms, Light Weapons, and Associated Ammunition*

5. First International Conference on Defence Technology (1st ICDT)

This conference was held during 21 - 25 October 2018 in Beijing, China. It brought together many different aspects of defence technology, including energetic materials, materials behaviour and properties, advanced manufacturing techniques, impact mechanics and electromagnetic launch technologies.

Presented papers dealt with research being conducted on pulsed power, hypervelocity, electromagnetic armour, prospective new energetic materials and new chemical propulsion concepts. They also covered practical problems related to quality control, aging, hazards, impact, disposal, and remediation of the energetic materials, in use today or in the near future, for space exploration or defence. Brought into focus were also manufacturing of composites, nano-materials and bio materials as well as applications of computer based manufacturing processes, machine vision and robotics, materials for aerospace engineering, armour materials, advanced nanostructured materials, advanced ceramics and composites, and additive manufacturing.

Visits to Beijing's historical attractions – Forbidden City, Summer Palace, Temple of Heaven, Olympic Park, the Great Wall and the Ming Tombs – made this conference memorable not only from a scientific and technical but also from a tourist point of view.

The number of participants was about 600, of which about 100 were foreigners; I was one of them.

Hans Wallin
Invited speaker (title: *International Ammunition Technical Guidance: Physical Security and Stockpile Management for All*)

Chemical Mathematics. No. 25.

Stig R Johansson

What most common people know about chemistry is that a lot of poisonous and dangerous elements and compounds are to be found there, and that a quantity called "pH" is "a measure of acidity".

The misconception just mentioned is surprising in view of the fact that the quantity being tampered with is the very basic one of chemistry: *concentration*, denoted [X]. The common dimension is "moles per litre", M. However, it is with X the uncertainty begins; it is, we are told, the ubiquitous "hydrogen ion". So far so good. But dealing with, *e. g.*, $[H_3O^+] = 10^{-7}$ M for processes in neutral water may be disturbingly impractical. Taking the logarithm gives the number -7 instead. But the minus sign is not to our liking either, thus "7".

A comprehensive description of "pH" has not yet come to my knowledge. What follows is an attempt to fill the gap, if any. By keeping the real ion $H(H_2O)_n^+$ and the fictive proton, H^+, apart, perhaps a thorough understanding of the pH quantity might prevent questions like "what is pH of ammonia in air" from being asked. For example.

pH – to be or not to be?

In "*Elementary Chemical Mathematics*" (AuthorHouse 2017), a general, solvent-independent definition of pH is proposed, followed by an account of the formal logical consequences. Substituting the proton for a not that clear enough "hydrogen ion", when it comes to it, follows naturally from the donor-acceptor method for chemical reaction formula writing. This method is based on an interchange of a "real" (*e.g*., NH_3), or "virtual" (*e.g*., the proton) "bartering" item between two virtual half reactions. One donates the chosen item, the other accepts it. Adding the two halves so that the item cancels, gives the complete reaction formula. (Many reactions are of this *donac* type.)

The textbook definition of pH is "the negative logarithm of hydrogen ion concentration":

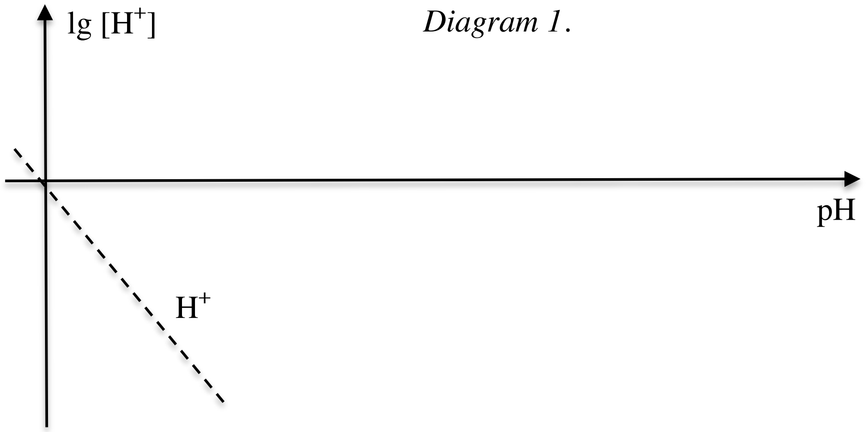
$$\mathrm{pH} \equiv -\lg ([H^+]/M) \qquad \text{E 1.}$$

This definition is an *identity*, therefore "≡" and not "=" (not so unimportant epistemological "clear concepts", p. 275). It means that pH is just an abbreviated, but practical way to say what the right member tells. Nothing more so far.

The quotient $[H^+]/M$ stands for a *dimensionless number* (more about that in Appendix II, "Equations, numbers and uncertainty"). In addition to solving the problem of logarithms being dimensionless – a problem surfacing with the Gran equations in titrimetry (p. 155) – it helps us to remember that the definition includes a *concentration dimension*. M stands for *molarity*, *i.e.*, moles per *litre* of *solution*. But pH scales can also be based on *molality*, moles per *kg* of the *solvent* and *molonity*, moles per *kg* of *solution*, all giving different pH numbers (conversion calculation – a tedious piece of work – is facilitated by conversion equations in Appendix III).

H^+ in E 1 is an easy-going and in the literature popular way to designate "hydrogen ion" in place of the more real H_3O^+, which in turn is a practical simplification for $H(H_2O)_n^+$. Here n summarises a couple of integers; a number that drives ΔS from looking negative (indicating *order* increase due to less species in the right member) to become positive (indicating *disorder* increase), the more so the higher the n, *e.g.*, for $H^+ + CrO_4^{2-} \rightarrow HCrO_4^-$ n > 2 makes ΔS > 0 (*e.g.*, $H(H_2O)_5^+ + CrO_4^{2-} \rightarrow HCrO_4^- + 5\ H_2O$, as determined experimentally). The general pH definition is the same as E 1, but with the express statement that H^+ – as it ought to – designates the "dry" *proton,* the "non-existing" auxiliary bartering item facilitating handling of acid-base reactions.

A graph depicting E 1 in its proton half reaction version is:



This graph is the basic template for acid-base diagrams. The proton line has *inclination* -1, or *arcus tangent*, arctg, -1, which means an angle of - 45°. The broken line indicates that it is *virtual*. The pH axis is ungraded; the next task is to grade it. Since acid-base reactions almost exclusively take place in water, we start with the acceptor half reaction:

$$H^+ + H_2O \rightarrow H_3O^+ \qquad \text{R 1.}$$

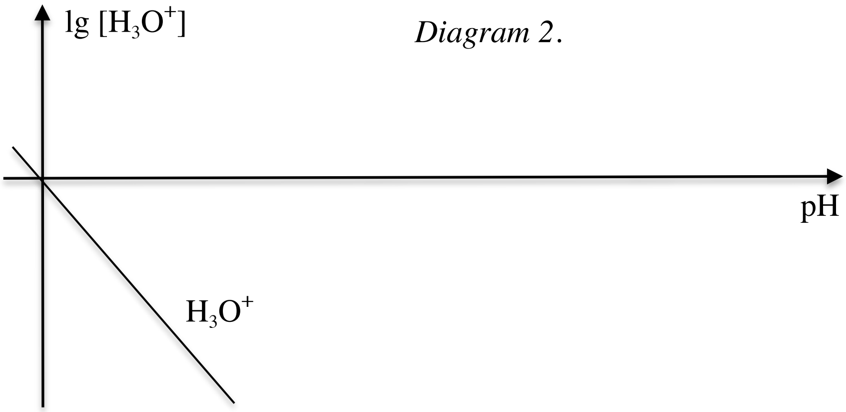
R 1 is a *standard reaction* with a virtual equilibrium constant defining the scale. Its value is best chosen as unity for the purpose:

$$\frac{[H_3O^+]}{[H^+]\{H_2O(l)\}} = K_1 = 1 \qquad \text{E 2.}$$

Instead of choosing the *concentration* of $[H_2O]$, it is more convenient to use the so called *activity* of liquid water. If it can be regarded as pure – or in great excess in the solution over the dissolved substance, the *solute* –, $\{H_2O(l)\} = 1$ (Do not omit "(l)" for "liquid"; $\{H_2O\}$ does also exist. It is a value close to $[H_2O] = 55$ M). Taking logarithms of E 1 gives:

$$\lg [H_3O^+] - \lg [H^+] - \lg \{H_2O(l)\} = \lg 1, \qquad \textit{i.e.}, \lg [H_3O^+] - \lg [H^+] = 0 \qquad \text{E 3.}$$

The graph, which now is in concordance with the textbook definition, is simply:



But still no numbers on the pH axis. Next step is to find them.

In water solutions, the conjugated *donating* half reaction is:

$H_2O \rightarrow H^+ + OH^-$ $K_2/M^2 = 10^{-14}$ R 2.

The method of reaction combination gives R 1 + R 2 = R 3, a full-fledged, real acid-base reaction:

$H^+ + H_2O \rightarrow H_3O^+$ lg K = 0

$\underline{H_2O \rightarrow H^+ + OH^- \quad \lg K = -14}$

$2\ H_2O \rightarrow H_3O^+ + OH^-$ lg K_3 = -14 R 3.

The equilibrium equation gives:

$\lg [H_3O^+] + \lg [OH^-] - 2 \lg \{H_2O(l)\} = -14$ E 4

or $-\lg [H_3O^+] - \lg [OH^-] = 14$.

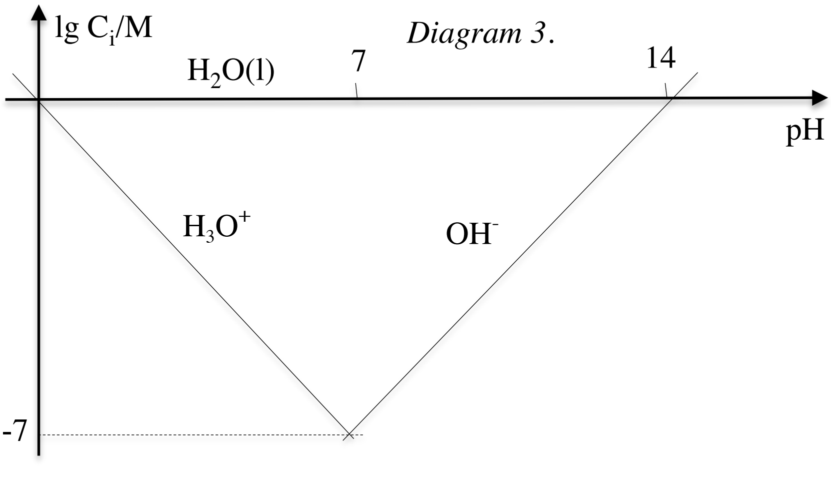
Completing Diagram 2 with the OH^--line:

$\lg [OH^-] = -\lg [H_3O^+] - 14$ E 5,

and taking E 3 into the picture (in order to maintain the E 1 definition in its proton version):

$\lg [OH^-] = -\lg [H^+] - 14 = pH - 14$ E 6

we see that said line has inclination +1 and intersects the pH axis at pH = 14, where lg $[OH^-]$ = = 0:



In a neutral water solution, $[OH^-] = [H^+] = 10^{-7}$ M (almost nothing, from an analytical point of view). What a lucky coincidence that lg K_3 happens to be -14.00 at 25 °C (the *standard* temperature), so we do not have to drag decimals along, when it comes to 7 and 14!

Here follows a concrete pH calculation example involving dissolved hydrogen sulphide, H_2S. Substituting R 2 for:

$H_2S \rightarrow H^+ + HS^-$ $K_4 = 10^{-6.9}$ M R 4

we get $H^+ + H_2O \rightarrow H_3O^+$ lg K = 0

$\underline{H_2S \rightarrow H^+ + SH^- \quad \lg K = -6.9}$

and thus $H_2S + H_2O \rightarrow H_3O^+ + SH^-$ $\lg K_5 = -6.9$ R 5.

The equilibrium expression is:

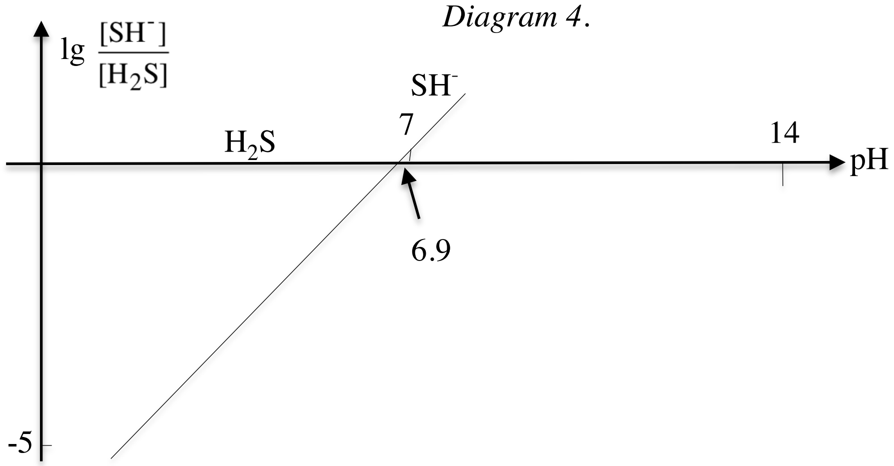
$$\frac{[H_3O^+][SH^-]}{[H_2S]} = K_4 = 10^{-6.9} M \qquad \text{E 7}$$

giving $\lg [H_3O^+] + \lg [SH^-] = \lg [H_2S] - 6.9$

and $$\lg \frac{[SH^-]}{[H_2S]} = pH - 6.9 \qquad \text{E 8.}$$

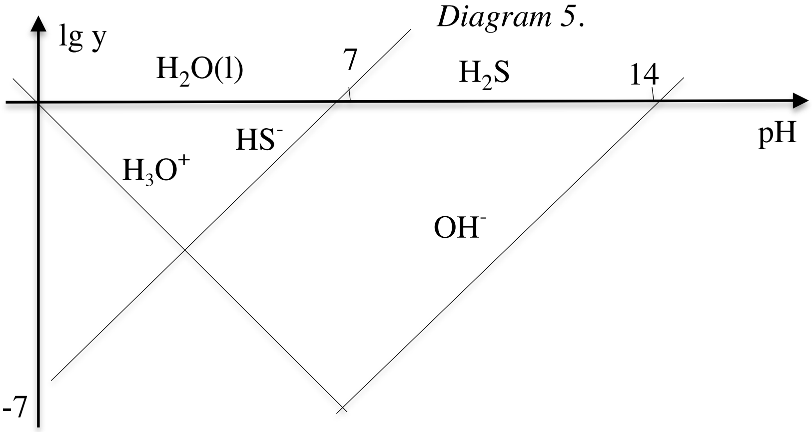
The ratio line in the left member has inclination +1 and intersects the pH axis at pH = 6.9, where $[SH^-]$ and $[H_2S]$ are equal. The corresponding graph turns out:

Diagram 4.



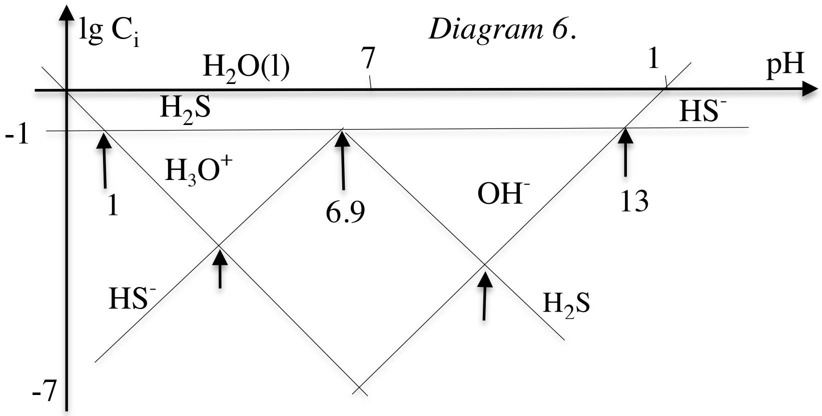
This is a pH *ratio* diagram showing how the SH^-/H_2S ratio varies with pH. Unlike OH^-, SH^- can take a step further: $HS^- \rightarrow H^+ + S^{2-}$. However, HS^- is a very weak acid, so S^{2-} can be neglected here. The diagram can be superimposed on the previous one:

Diagram 5.



Here y is either a concentration or a ratio. The vertical distance between the lines gives the ratio between all species as a function of pH. A lot of information in a simple, easy-to-draw diagram!

In an *absolute*, or *concentration* diagram, pH can be read – or geomatrically calculated – for C M H_2S or HS^- solutions. Below a diagram for C = 0.1 M and thus lg C = -1.



The pH of 0.1 M H_2S is ½(1+6.9) = 4.0, that of 0.1 M NaSH ½(6.9+13) = 10.0.

In the case of liquid ammonia, $NH_3(l)$, being the solvent, the standard reaction is:

$NH_4^+ \rightarrow H^+ + NH_3$ R 6

with $\frac{\{NH_3(l)\}[H^+]}{[NH_4^+]} = K_6 = 1$ E 9

and $\lg \{NH_3(l)\} + \lg [H^+] - \lg [NH_4^+] = \lg 1$ E 10.

The proton acceptor is NH_2^-:

$NH_2^- + H^+ \rightarrow NH_3$ R 7.

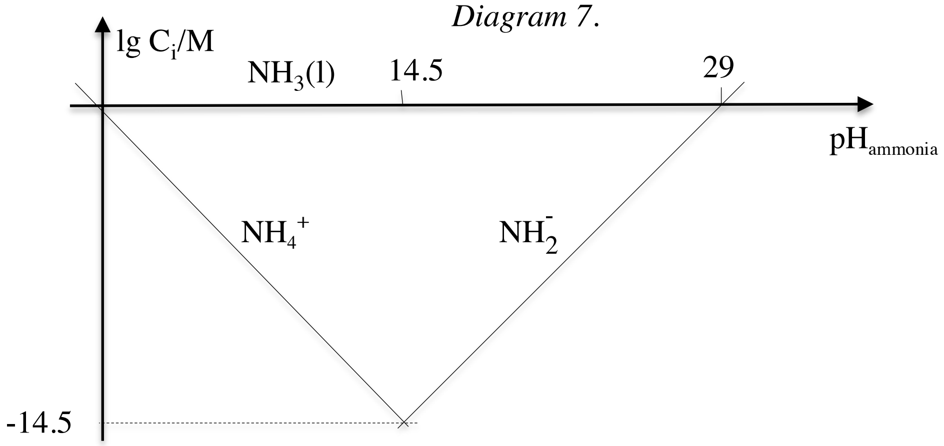
Combining R 5 and R 7:

$NH_4^+ \rightarrow H^+ + NH_3 \quad \lg K_6 = 0$

$\underline{NH_2^- + H^+ \rightarrow NH_3 \quad \lg K_7 = -29}$

gives $2\ NH_3 \rightarrow NH_4^+ + NH_2^- \quad \lg K_8 = -29$ R 8.

The pH diagram becomes:



Another example of a *protonic* solvent is liquid dihydrogen sulphate, $H_2SO_4(l)$ (not really "sulphuric acid" for the same reason as the solvent H_2O is not an "acid" either). Whether a protonic solvent acts as an acid or as a base depends on the actual acid-base system. However,

H_2SO_4(l) is very hygroscopic and cannot exist in the physical world; the technical quality contains 98 w-% (per cent by weight) H_2SO_4 at most, and 2 w-% H_2O. Thus, water is now a solute like H_2S is in the "water" example above.

Since commercial H_2SO_4(l) normally is used as an acid, "sulphuric acid" is fairly adequate. The reaction between the solvent and the solute is R 11:

$$H_2SO_4 \rightarrow H^+ + HSO_4^- \qquad K_9 \qquad \text{R 9}$$

$$\underline{H^+ + H_2O \rightarrow H_3O^+} \qquad K_{10} \qquad \text{R 10}$$

$$H_2SO_4 + H_2O \rightarrow HSO_4^- + H_3O^+ \qquad K_{11} \qquad \text{R 11.}$$

$$\frac{[H_3O^+][HSO_4^-]}{[H_2O]\{H_2SO_4(l)\}} = K_{11}\,M \qquad \text{E 11.}$$

The standard reaction defining the sulphuric-acid pH scale is:

$$H_3SO_4^+ \rightarrow H^+ + H_2SO_4 \qquad \lg K_{12} = 0 \qquad \text{R 12}$$

$$\frac{[H^+]\{H_2SO_4(l)\}}{[H_3SO_4^+]} = 1 \qquad \text{E 12,}$$

thus $-pH \equiv \lg [H^+] = \lg [H_3SO_4^+]$ E 13.

Per 1 kg = 1000 g, the water solution (now meaning the opposite of what it normally does!) contains 980 g H_2SO_4 and 20 g H_2O = 1.1 mol. Thus, concentrated commercial sulphuric acid is a 1.1 *molonal* "water" solution (for conversion to molarity, if that would be preferred, the density of the solution has to be known; p. 287). In this application, the E 1 definition becomes (in order for the dimensionless equations method to work smoothly, we need the dimension symbol μ for molonity):

$$pH_{\text{sulph.acid}} = -\lg ([H^+]/\mu) \qquad \text{E 14.}$$

Values of K_9, K_{10} and K_{11} refer to "concentrated sulphuric acid"; if they could be found, the dimension would most likely be M^2, M^{-1} and M, respectively. With them, diagrams akin to Diagram 3 and 7 could be drawn with a (pH)basic HSO_4^- line and a horizontal reference line marked H_2SO_4(l) coinciding with the $pH \equiv -\lg ([H^+]/M)$ axis.

So far straight math work based on E 1, the purpose being to show how the solvent independent proton-based definition works in all its practical details. The resulting knowledge ought to be as solid as solid can be. With this knowledge, the question "*What is the pH of ammonia gas in air?*" asked in a "letter to the editor" of a technical journal (p. 81) would not have been asked – and the editor should have been able to answer the question, which he does not seem to have done. The simple answer is that a "hydrogen ion concentration", *i.e.*, pH, can only exist in protonic, liquid solvents providing a standard reaction for the scale.

When the Danish chemist Søren Sørensen introduced his "p_H" – *potentia hydrogenii* – in 1909, it was just as a handy notation. Its designation as a pretentious "concept" gives evidence of lack of epistemological understanding. According to current "consensus" the introduction of pH was "*a significant event in the history of chemistry*". It was certainly not, it was epistemologically questionable.

Strangely enough, the "concept" notion was enhanced by G. N. Lewis, who in 1923 introduced his "generalized acid-base concept" (p. 16). Lewis acids are donac reactions with electron pairs as bartering item. In 1939 we also got Lux acids, characterized by O^{2-} interchange in molten salts. (If for some reason it be desirable to group such "acids" together, allusion to our sense of taste should stay with the original Brønstedt acid.)

The merit of the proton definition might be that it helped us to "*notice what we did not notice before; and to notice it in ways which are new to us, and probably strange*" (W. A. Sinclair on p. 277), such as the standard reaction requirement for defining a solvent-dependent pH scale, and thus that these scales differ from each other – and from the water scale with its typical $0 < \mathrm{pH} < 14$ grading range. And that pH is not a concept but a trivial though practical denotation.

Another example of the modest quantity $[H_3O^+]$ running wild, so to say, is a large number of "concept" proposals aiming at zero value for neutral water; they range from Wherry & Adams 1921 ($x_H \equiv 7 - \mathrm{pH}$) to Gerstle 1928 ($N_h \equiv \lg(\{H^+\}/\{H^+\}_{ref.})$). Others are Derrien & Fontès 1923 ($DF = -\lg([H^+]/\mu M)$, giving $DF = 1$ for neutral water) and Crane 1962 ($cH \equiv \lg[H^+]/M + 16$), giving $cH = 9$ for neutral water).

Even if the general "pH" works well in some other protonic solvents besides water, and so far elucidate the proton/hydrogen-ion confusion, the ultimate question waiting down the lane has to be answered: To what avail? As far as non-water chemical systems are concerned, the answer seems to be "none". In fact, the Hammet acidity function, H_0, is an alternative to pH that has found practical use for the study of acid-catalysed organic reactions in very strong acids such as fuming H_2SO_4.

So, back to where it all started, *i.e.*, water solutions alone with its familiar "0 – 14" range. All we need to do is to change, not the verbal definition of the textbook definition, but the designation:

$$\mathrm{pH} \equiv -\lg[H_3O^+] \text{ or } \mathrm{pH} \equiv -\lg\{H_3O^+\} \text{ if need be.}$$

And why not letting "pH" in its proton version denote the abscissa in pH diagrams, tacitly understood.

With the aid of the general "definition", a closer look at "pH" now hopefully restored $[H_3O^+]$ from its unnecessarily manipulated Sørensen shape.

And thus the native hue of resolution is sicklied o´er with the pale cast of thought.
(Shakespeare, *Hamlet*, Act III, Scene 1)

THE END

Conferences

2019

01-27--30	45th International Conference on Explosives & Blasting. Nashville, Tennessee, USA. International Society of Explosives Engineers, http://www.isee.org.
05-06--08	17th International Conference on Numerical Combustion. German Section of the Combustion Institute, Aachen, Germany. http://www.nc19.itv.rwth-aachen.de/
07-07--12	Summer School 2019. Combustion Institute, Cambridge, England.
07-14--19	The 32nd International Symposium on Shockwaves. Combustion Institute, University of Singapore, Singapore-
09-11--13	AEM 2019 Advanced Energy Materials. University of Surrey, Guildford, England.

2020

?-?-?	Second International Conference on Defence Technology (2nd ICDT). China somewhere.

Education and Training

Sverige

KCEM. För aktuella konferenser och kurser, se www.kcem.se.

FOI. Grundkurs i explosivämneskunskap. http://www.foi.se.
Del 1: 18-22 mars. Del 2: 8-11 april.
Platser: Nynäsgården och FOI Grindsjön.

Anmälan senast 2019-01-31.

U. K.

University of Leeds. www.leeds.ac.uk.

The Royal Military College of Science. www.rmcs.cranfield.ac.uk.

Imperial College, London
Best practices guidelines for CFD of turbulent combustion.
London, 11th and 12th December 2019.

U. S. A.

Franklin Applied Physics. Visit info@franklinphysics.com.
Courses on Electroexplosive Devices: Functioning, Reliability, and Hazards will be held in Oaks, PA, USA, 21-25 January 2019, and 22-25 July 2019.

International Society of Explosives Engineers. Visit www.isee.org/ for the society's newsletter *Explosives Industry News*.

Munitions Safety Information Analysis Center, MSIAC. Visit http://www.msiac.nato.int.