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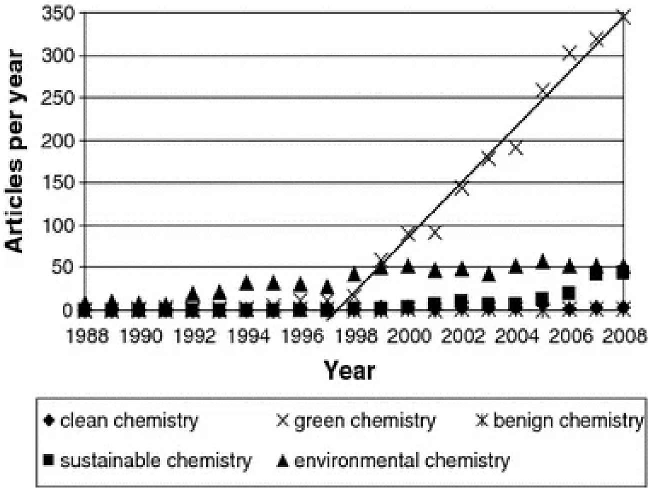
Foundations of Chemistry, 2010, 12, 55–68

An overview: origins and development of green chemistry

J. A. Linthorst

ABSTRACT This article provides an overview of the origins and development of green chemistry. Aiming to contribute to the understanding of green chemistry, basically from a historical point of view, this overview argues that contextual influences and the user friendliness of the term are drivers for the explosive growth of green chemistry. It is observed that political support for its development has been significant, in which the Pollution Prevention Act of 1990 was a formal political starting-point, but informally the origins of green chemistry go back to before 1990. US EPA played an important role in all this, but did not solely contribute to the growth of green chemistry.



Link: https://link.springer.com/article/10.1007/s10698-009-9079-4

Foundations of Chemistry, 2020, 22, 309–334

Conceptual confusion in the chemistry curriculum: exemplifying the problematic nature of representing chemical concepts as target knowledge

K. S. Taber

ABSTRACT This paper considers the nature of a curriculum as presented in formal curriculum documents, and the inherent difficulties of representing formal disciplinary knowledge in a prescription for teaching and learning. The general points are illustrated by examining aspects of a specific example, taken from the chemistry subject content included in the science programmes of study that are part of the National Curriculum in England (an official document published by the UK government). In particular, it is suggested that some statements in the official curriculum document are problematic if we expect a curriculum to represent canonical disciplinary knowledge in an unambiguous and authentic manner. The paper examines the example of the requirement for English school children to be taught that chemical reactions take place in only three different ways (i.e., proton transfer; electron transfer; electron sharing) and considers how this might be interpreted in terms of canonical chemistry and within the wider context of other curriculum statements, in order to make sense of neutralisation and precipitation reactions. It is argued that although target knowledge that is set out as the focus of teaching and learning cannot be identical to disciplinary knowledge, the English National Curriculum offers a representation of chemistry which distorts and confuses canonical ideas. It is suggested that the process of representing the disciplinary knowledge of chemistry as curriculum specifications is worthy of more scholarly attention.

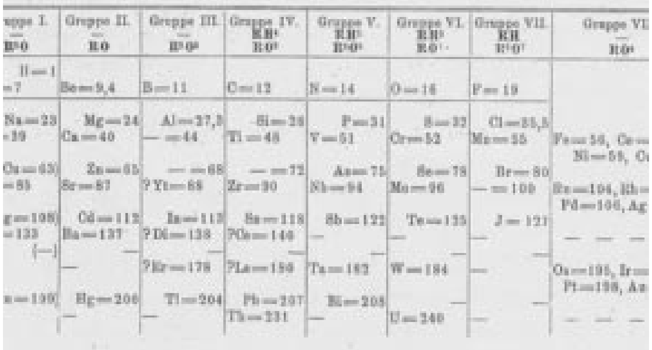
Link: https://link.springer.com/article/10.1007/s10698-019-09346-3

Foundations of Chemistry, 2020, 22, 197–215

How Mendeleev issued his predictions: comment on Andrea Woody

C. Campbell, K. Pulkkinen

ABSTRACT Much has been said about the accuracy of the famous predictions of the Russian chemist Dmitrii Ivanovich Mendeleev, but far less has been written on *how* he made his predictions. Here we offer an explanation on how Mendeleev used his periodic system to predict both physical and chemical properties of little-known and entirely unknown chemical elements. We argue that there seems to be compelling evidence in favour of Mendeleev genuinely relying on his periodic system in the course of issuing his predictions—a point recently contested by Woody (in: Soler, Zwart, Lynch, Israel-Jost (eds) Science after the practice turn in the philosophy, history, and social studies of science, Routledge, Abington, 2014). In particular, by using the known properties of a number of near neighbours of the three entirely unknown elements (the so-called eka-elements), we seek to show how the very format of his table enabled it to function as a powerful tool for Mendeleev in arriving at his predicted values. We suggest that Mendeleev's use of the periodic system in making his prediction gives an illuminative example of what Woody calls "theoretical practices" in science.



ppe I. R^2O	Gruppe II. RO	Gruppe III. R^2O^3	Gruppe IV. RH^4 RO^2	Gruppe V. RH^3 R^2O^5	Gruppe VI. RH^2 RO^3	Gruppe VII. RH R^2O^7	Gruppe VI RO^4
H = 1							
= 7	Be = 9,4	B = 11	C = 12	N = 14	O = 16	F = 19	
Na = 23	Mg = 24	Al = 27,3	Si = 28	P = 31	S = 32	Cl = 35,5	
= 39	Ca = 40	— = 44	Ti = 48	V = 51	Cr = 52	Mn = 55	Fe = 56, Co = Ni = 59, C
Cu = 63)	Zn = 65	— = 68	— = 72	As = 75	Se = 78	Br = 80	
= 85	Sr = 87	? Yt = 88	Zr = 90	Nb = 94	Mo = 96	— = 100	Ru = 104, Rh = Pd = 106, Ag
g = 108)	Cd = 112	In = 113	Sn = 118	Sb = 122	Te = 125	J = 127	
= 133	Ba = 137	? Di = 138	?Ce = 140	—	—	—	— — —
(—)	—	—	—	—	—	—	
	—	? Er = 178	?La = 180	Ta = 182	W = 184	—	Os = 195, Ir = Pt = 198, Au
u = 199)	Hg = 200	Tl = 204	Pb = 207	Bi = 208	—	—	
	—	—	Th = 231	—	U = 240	—	— — —

Link: https://link.springer.com/article/10.1007/s10698-020-09355-7

Qualche idea per le attività pratiche

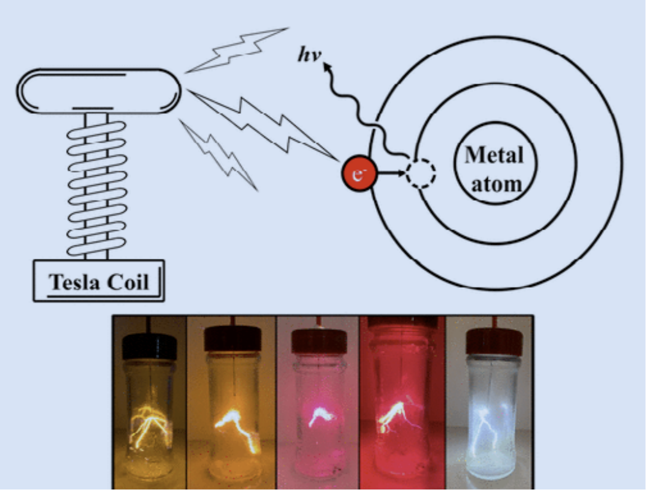
Journal of Chemical Education, June 2022

An Alternative to the Flame Test: Using Inexpensive Tesla Coils to Produce the Emission Spectra of Metal Salts

J. Chem. Educ. 2022, 99, 7, 2766–2771

A. Milne

ABSTRACT High-voltage plasma arcs from solid-state Tesla coils were used to produce characteristic atomic emissions of various metals. The colored arcs produced were highly visible and vibrant, making for a spectacularly engaging demonstration for groups of varying sizes. The demonstration used an inexpensive solid-state Tesla coil to generate low-current, high-frequency, high-voltage electrical arcs that atomize and excite metal salts within a constructed vessel, eliciting the associated characteristic spectral emissions as a result. The demonstration serves as a valuable, accessible, and safer alternative to solvent-based demonstrations. Specifically, this method can challenge student misconceptions associated with the traditional flame test due to the flameless nature of the arcs. The demonstration also introduces the mechanisms underpinning inductively coupled plasma atomic emission spectrometers, which are commonplace in analytical laboratories. The high-frequency nature of the Tesla coil arcs reduces the risks of burns and can facilitate further discussions regarding plasma, states of matter, electron behavior, electricity, and alternate forms of spectroscopy.



Link: https://pubs.acs.org/doi/10.1021/acs.jchemed.2c00273

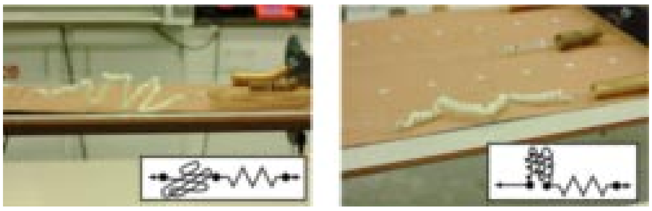
Journal of Chemical Education, June 2022

Using Magnets and Flexible 3D-Printed Structures to Illustrate Protein (Un)folding

J. Chem. Educ. 2022, 99, 8, 3074–3082

I. Popa, F. Saitis

ABSTRACT Proteins are “magical” workers inside our body, as they accomplish most of the cellular functions. Here we report on a novel approach to teach protein folding and unfolding, using magnets and flexible 3D-printed protein structures. To illustrate this physical process, we used colored circular magnets designed for whiteboards, connected through paper clips. Several protein structures were then 3D-printed, using both standard and flexible materials. Protein unfolding under force was then investigated by adding slotted weights to a setup consisting of three experiments: a simple spring, a spring in series with a sealed syringe (representing a dashpot), and a spring in series with a printed protein structure. All of the experiments shown here were done as part of the event, organized by the University of Wisconsin-Milwaukee. The approach presented here complements the use of other techniques to learn about protein folding and constitutes a novel way to explain how mechanical unfolding *in vivo* relates to a gain-of-function.



Link: https://pubs.acs.org/doi/10.1021/acs.jchemed.2c00231

Journal of Chemical Education, July 2022

Gold at the End of the Rainbow: A Simple and Colorful Modification of the Golden Penny Demonstration

J. Chem. Educ. 2022, 99, 8, 3083–3086

T. S. Kuntzleman, L. T. Hogan

ABSTRACT The “Golden Penny” demonstration is a popular experiment that involves treating copper coins with chemical reagents to form brass, an alloy of copper and zinc that has a golden color. Reported here is a very simple modification for forming golden color on copper coins that does not require the use of chemical reagents. Instead, golden colored surfaces can be generated by simply heating copper coins on a hot plate to form nanoscale films of copper oxide. In addition to gold, such oxide layers display a range of other colors including orange, magenta, violet, and silver.

Link: https://pubs.acs.org/doi/10.1021/acs.jchemed.2c00545