

to tabulate the more exactly calculated magneton numbers expected from the different theories.

For the magnitude of the Bohr magneton ($N \frac{he}{4\pi m}$), 5564 erg gauss⁻¹ mol⁻¹ has been accepted,⁴ where the spectroscopic value of e/m has been used.⁵

The experimental Weiss magneton, in terms of which the measurements are usually described, has the value 1123.5 erg gauss⁻¹ mol⁻¹. The ratio of the two units is 4.952.

Hund's theory leads to the formula $p = 4.952 \sqrt{j(j+1)}$; the theory of Bose and Stoner to $p = 4.952 \sqrt{4s(s+1)}$.

The values of p for the group of rare earths (following Hund), and for the iron group, are tabulated next to the numbers, as given by the authors themselves.

RARE EARTHS.

Number Electrons.	Ion.	Basic Level.	p_H .	p_H foll. Hund.
55	Ce'''	² F _{5/2}	12.56	12.5
56	Pr'''	³ H ₄	17.72	17.8
57	Nd'''	⁴ J _{9/2}	17.92	17.8
58	Il'''	⁵ J ₄	13.29	13.4
59	Sa'''	⁶ H _{5/2}	4.19	4.2
60	Eu'''	⁷ F ₀	0	0
61	Gd'''	⁸ S _{7/2}	39.31	39.4
62	Tb'''	⁷ F ₆	48.14	48.3
63	Dy'''	⁶ H _{15/2}	52.72	52.8
64	Ho'''	⁵ J ₃	52.53	52.8
65	Er'''	⁴ J _{15/2}	47.45	47.7
66	Tu'''	³ H ₆	37.44	37.6
67	Yb'''	² F _{7/2}	22.46	22.5

IRON GROUP.

Number Electrons.	Ions.	Basic Level.	p_H .	p_H foll. L.-S.	$p_{B.-st.}$	$p_{B.-st.}$ foll. St.
19	V'''	² D _{3/2}	7.67	7.7	8.58	8.6
20	V'''	² F ₂	8.09	8.1	14.01	14.1
21	Cr'''	⁴ F _{3/2}	3.84	3.9	19.18	19.3
22	Mn'''	⁵ D ₀	0	0	24.26	24.4
23	Fe'''	⁶ S _{5/2}	29.30	29.6	29.30	29.4
24	Fe'''	⁶ D ₄	33.22	33.6	24.26	24.4
25	Co'''	⁴ F _{9/2}	32.85	33.2	19.18	19.3
26	Ni'''	³ F ₄	27.68	28.0	14.01	14.1
27	Cu'''	² D _{3/2}	17.58	17.7	8.58	8.6

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Natuurk. Laborat. der Rijks-universiteit, Leyden, June 4.

¹ F. Hund, *Zeit. f. Phys.*, **33**, 855; 1925.
² O. Laporte and A. Sommerfeld, *Zeit. f. Phys.*, **40**, 333; 1926.
³ D. M. Bose, *Zeit. f. Phys.*, **43**, 864; 1927. E. C. Stoner, *Phil. Mag.*, **8**, 250; 1929.
⁴ R. T. Birge, *Phys. Rev. Suppl.*, vol. i.; 1929.
⁵ Even the last deflection measurements point to the 'spectroscopic' value. C. T. Perry and E. L. Chaffée, *Phys. Rev.*, **36**, 904; 1930.

Measurement of the Electricity Liberated during the Downgrade Reactions of Organic Compounds.

THE possibility of deriving electrical energy from an organic reaction proceeding irreversibly in one half-ement of a cell seems so unlikely on general grounds that an attempt has been made to repeat the observations recorded by Prof. Potter under the above title in NATURE of April 11. Briefly, Prof. Potter found that if the cell

carbon (or stainless steel) | dilute HCl | porous pot | CuSO₄ solution | copper is short-circuited, no current passes; if, however, zinc is placed in the acid out of contact with the electrode, copper is deposited on the right-hand electrode so long

as the zinc continues to dissolve. He further found that, if the acid is replaced by 15 per cent sugar solution and the cell is short-circuited, copper is deposited on the electrode as soon as yeast is added to the sugar solution, but not before. Prof. Potter also found that a primary cell (capable of electrolysing copper sulphate solution) is obtained from the combination

carbon	15 per cent sugar solution	porous pot	15 per cent sugar solution and yeast	carbon
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the electrode in the fermenting half of the cell being negative. Observations were further recorded in which the decay of lawn mowings and other organic matter was made to produce electrolysis.

When I repeated Prof. Potter's experiments with the first type of cell, I found small random changes in weight of the copper electrodes which, however, were affected neither by the addition of zinc to the acid nor by the addition of yeast to the sugar solution. Furthermore, control copper electrodes, immersed in the copper sulphate solution but unconnected to the other electrode of the combination, showed exactly similar changes in weight.

To explore the matter further, the cell

carbon	$\frac{N}{5}$ HCl	saturated KCl	$\frac{N}{5}$ CuSO ₄	Cu
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was set up and its E.M.F. was measured on a potentiometer. The cell was found to give a substantial but variable E.M.F. ranging from 0.1 to 0.3 volt; the carbon electrode was usually positive, so that if the cell had been short-circuited, copper would not have deposited but would have dissolved. When zinc was placed in the acid, its solution caused no substantial change in the sign or magnitude of the E.M.F.

The replacement of the acid by 15 per cent sugar solution yielded a cell in which the carbon was positive to about the same extent. The addition of yeast and subsequent fermentation produced none but random variations in the E.M.F. of the combination.

The cell

carbon	15 per cent sugar solution	porous pot	15 per cent sugar solution and yeast	carbon
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was set up several times. It yielded an initial E.M.F. entirely fortuitous in sign and upon which the subsequent fermentation produced no systematic effect. Like all the other combinations measured, this cell polarised with great readiness.

In none of my observations is there any evidence, therefore, of a continuous supply of electrical energy from a chemical reaction proceeding irreversibly. Neither the solution of the zinc nor the fermentation of the sugar had any effect on the E.M.F. of the cell beyond the random effects to be anticipated during the liberation of gases in the neighbourhood of an indeterminate and readily polarisable electrode such as carbon.

Since making these observations I have been in correspondence with Prof. Potter. We have not succeeded in discovering any significant discrepancy in the two sets of experimental conditions beyond the fact that I used pure sucrose while Prof. Potter used unrefined sugar. Apart from their effect on the internal resistance of the cell, it seems unlikely that the impurities could play a decisive part.

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