

If the forces between enzyme and metabolite or drug are electrical in nature, then similarly charged ions are overwhelmingly best fitted to compete with one another for the enzyme. However, the fact that substances with both acid and basic groups exist in solution as an equilibrium mixture of the four different electrical forms, in the proportion determined by the pH and the pK_a , would render all substances in the accompanying table capable of competing with one another to some extent; but when a substance intended to displace an essential metabolite from an enzyme is mainly in a different electrical form from the metabolite, then the concentration required for its action may be so high as to exclude its use as a drug.

Substance	pK_a (basic group)	pK_a (acid group)	Principal ionic form at pH 7.3
Benzylamine-4-sulphonamide (I)	8.18	10.23	cationic
Benzylamine-4-carboxylic acid (II)	9.64	3.59	zwitterionic
Sulphanilamide (for comparison)	2.1	10.3	un-ionized
<i>p</i> -Aminobenzoic acid (for comparison)	2.2	4.9	anionic

Applying the Mass-Law equation

$$pH - pK_a = \log \frac{[B]}{[BH^+]}$$

one deduces that, at the physiological pH value (7.3), benzylamine sulphonamide exists mainly in the form of positive ions, whereas sulphanilamide exists as uncharged molecules plus a small proportion (0.1 per cent) of negative ions (this proportion increasing as the potency of sulphanilamide is increased by substitution, as in sulphathiazole and sulphadiazine⁵). Similarly, *p*-aminobenzoic acid exists mainly as negatively charged ions. Thus it is unlikely that benzylamine sulphonamide can compete effectively for the same position on the enzyme surface as the oppositely charged *p*-aminobenzoic acid.

Accordingly, it is postulated that benzylamine sulphonamide acts on a different enzyme from that involving *p*-aminobenzoic acid. Whether benzylamine-4-carboxylic acid can antagonize the antibacterial action of benzylamine sulphonamide remains to be determined. This possibility is not excluded by the above results, but it will depend, of course, on whether benzylamine-4-carboxylic acid is an essential metabolite, as demanded by the Woods-Fildes theory.

The benzylamine-4-sulphonamide was prepared by Prof. A. K. Macbeth, University of Adelaide, and the benzylamine-4-carboxylic acid (new synthesis)⁶ by Dr. A. Albert, University of Sydney, who are hereby thanked.

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¹ Mitchell, G., Rees, W., and Robinson, C., *Lancet*, 627 (1944).

² Selbie, F., and McIntosh, J., *Brit. J. Exper. Path.*, 24, 246 (1943).

³ Schreuss, H., *Klin. Wochschr.*, 21, 671 (1942).

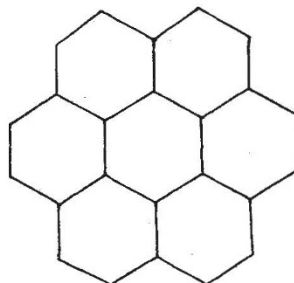
⁴ Albert, A., and Goldacre, R., *Nature*, 149, 245 (1942).

⁵ Bell, P., and Roblin, R., *J. Amer. Chem. Soc.*, 64, 2905 (1942).

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Structure of Coronene

IN a recent communication¹, Robertson and White have reported provisional crystal structure determinations for coronene, $C_{24}H_{12}$. The molecule has great symmetry, as is shown by the figure. In view of the importance of this molecule in coal formation, some purely theoretical calculations I have made may be worth mentioning. Using the methods developed in an earlier paper², the energies of the mobile electrons have been computed in terms of the fundamental resonance integral β . From this it is easy to calculate the bond-orders and -lengths. The table below shows (i) the mean energy of the mobile



Coronene, $C_{24}H_{12}$

electrons; (ii) the mean order of the C-C bonds; (iii) the order of the six central C-C bonds; (iv) the mean length of the C-C bonds; and (v) the length of the central bonds. Similar values are given for benzene and graphite. The last decimal place in the lengths is valid on a relative scale, but not on an absolute one. It may be added that the only experimental data used in this table are the lengths of the C-C, C=C and C≡C bonds in ethane, ethylene and acetylene.

PROPERTIES OF THE CORONENE MOLECULE.

	Coronene	Graphite	Benzene
Mean energy per mobile electron	1.440 β	1.576 β	1.333 β
Mean order of C-C bonds	1.576	1.525	1.667
Order of central C-C bonds	1.522	1.525	1.667
Mean length of C-C bonds (A.)	1.406	1.417	1.389
Length of central bonds (A.)	1.418	1.417	1.389

It is evident from the table that coronene lies between benzene and graphite, being nearer to the latter. The central bonds are very similar to the bonds of graphite, though the mean bond-length is about 0.01 A. shorter. This confirms the provisional conclusions of Robertson and White.

Further details will be published elsewhere.

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¹ *Nature*, 154, 605 (1944).

² Coulson, C. A., *Proc. Roy. Soc., A*, 169, 413 (1939).

Genetics of Woodlice

THE work of Howard and Vandel on the genetics of the terrestrial Isopoda are well known, and their erudite memoirs have opened up a new chapter in genetics. As illustrating the profound difficulties of the geneticist, the following facts are of interest. Unfortunately, I do not possess that knowledge of genetics to explain the following phenomena, but would gladly welcome some enlightenment.