

The general solution of this system of equations is obtained in the form of four convergent series expansions. For the derivation of the exact solution and subsequent discussion of its properties (Chapters 4-7) a particularly elegant matrix notation is introduced which greatly condenses and simplifies the presentation.

In the final three chapters (9-11) the important points emerging from the general theory are illustrated by detailed applications to some well-known physical problems; these are barrier transmission problems, the bound states of a particle in a potential well, and the radial wave equation for a spherically symmetric potential.

The material in this book, which is clearly presented and well illustrated with contour diagrams, should be of interest to many theoretical physicists. D. W. WOOD

HYDROGENATION

Catalytic Hydrogenation

Techniques and Applications in Organic Synthesis. By Robert L. Augustine. Pp. xii + 188. (London: Edward Arnold (Publishers), Ltd.; New York: Marcel Dekker, Inc., 1965.) 72s. 6d. net.

FOR more than half a century the techniques and mystiques of catalytic hydrogenation have been fruitfully used in synthetic organic chemistry, and a great deal of information of what catalyses which reaction and under what conditions lies scattered throughout the chemical literature. Dr. Augustine has performed a useful function in summarizing what is known in this field and presenting it in a form which will be readily assimilated by experimental organic chemists.

After a brief introduction, Chapter 2 treats apparatus and techniques with quite detailed descriptions of equipment used both at atmospheric pressure and at elevated pressure, with proper emphasis in the latter case on safety precautions. Chapter 3 deals with catalysts and conditions; the preparation, properties and catalytic usefulness of hydrogenation catalysts in common use (Raney nickel, copper chromite, Adams platinum oxide, palladium on charcoal, etc.) are described. The reader could, however, be pardoned for forming the erroneous impression that there is only one manufacturer of supported noble metal catalysts.

It is in the second part of this chapter that Augustine's presentation is weakest. The proper choice of reaction conditions is of paramount importance in determining the yields of products, but the effect of agitation is dismissed in one sentence without mentioning diffusion or transport control, and although efficient use of the catalyst is clearly not a prime consideration in preparative organic chemistry, it is well established that agitation conditions can effect selectivity in multi-stage reactions. The effect of temperature is likewise dismissed somewhat lightly. There is no mention of the fact that the increase in vapour pressure of the solvent with temperature serves to reduce the partial pressure of hydrogen and that this can under certain circumstances give an apparently negative activation energy. The effect of quantity of catalyst is also discussed without reference to diffusion limitation in a monumentally cumbersome sentence. The author's style in this section is often obtuse, and sometimes ambiguous. The sentence (page 46): "All hydrogenations, except that of nitro groups, in which a nickel catalyst is used, increase in rate with the addition of base", besides being ungrammatical, is capable of two distinct interpretations: such is the power of the mighty comma!

There follow two chapters on the hydrogenation of functional groups in which the author considers in turn the various reducible groups encountered in organic chemistry: he starts each section by stating a general recipe for the hydrogenation, and subsequently enlarges

and qualifies this by means of illustrative examples. Perhaps wisely, the author eschews any mechanistic discussion, although some further attempt at rationalization of the observations would not have come amiss. It is, however, these two sections, and the following chapter on hydrogenolysis, which will be most widely appreciated and used.

It is commonplace, to-day, to complain of the price of scientific books: many, I fear, will wonder whether 72s. 6d. is not too high a price to pay for less than 200 pages, whatever their value. G. C. BOND

LIVING STRESS

The Physiology of Human Survival

Edited by O. G. Edholm and A. L. Bacharach. Pp. xxii + 581. (London: Academic Press, Inc. (London), Ltd.; New York: Academic Press, Inc., 1965.) 140s.

IN their introductory remarks the editors state that this book arose from discussions between themselves about the factors affecting the survival of the individual and his ability to adapt to changing conditions. They have gathered together articles by sixteen writers, physiologists and psychologists, relating primarily to the responses of human beings to a wide variety of external and internal stresses ranging from those of extremes of temperature and pressure on the one hand to sleep deprivation and pregnancy on the other. The editors aimed at bringing together all the important information at present available on the effects of environmental stress on man including, where it is necessary for a more complete understanding, accounts of the effects on other mammals. It is relatively easy to pick out areas which have not been dealt with in this book, but the editors point out that they did not intend it to be all-embracing and in certain respects it may be regarded as being complementary to the volume in the Handbook of Physiology series published by the American Physiological Society on *Adaptation to the Environment* which dealt with the whole animal kingdom. The contributors were asked not to produce a complete review of their subject but rather to concentrate on their own fields of research within the subject allocated to them. This request has been met by a variety of responses so that the scope of the articles ranges from a comprehensive review of the effects on man of deficiencies and excesses of water and salt intake by W. S. S. Ladell to a relatively detailed account by J. D. Hatcher of his own work on the humoral mechanisms responsible for the increase of cardiac output induced by acute anoxic anoxia.

The first six chapters of the book deal with the responses of man to stresses associated with changes in his physical environment. The first two chapters, one on the effects of cold by L. D. Carlson and A. C. L. Hsieh, and the other by R. H. Fox on the effects of heat, reflect the different interests of these authors. Thus, while the chapter on cold is based on a mathematical treatment of heat exchange, Fox deals at length with the problems of finding a reliable index of heat stress and the techniques for studying and determining the physiological changes responsible for heat acclimatization. Hatcher's account of the cardiovascular and respiratory responses to acute anoxia is followed by a comprehensive description by L. G. C. E. Pugh of the adaptive responses to hypoxia which occur on prolonged exposure to high altitudes. A brief review of the physiological effects of exposure to high pressures by H. J. Taylor shows the many phenomena in this field which invite further study. Progress in one particular field is illustrated by P. B. Bennett's article on the narcotic action of inert gases. An authoritative account by P. Howard of the effects of high and low gravitational forces brings out the contrast between extensive present-day knowledge of the mechanisms which underlie man's reactions to the stress of increased gravitational field and the paucity of