THE CHEMICAL FORMULARY

BENNETT

VOL. XV

CHEMICAL PUBLISHING COMPANY

The Chemical Formulary

A Collection of Commerical Formulas, Collected During 1968, for Making Thousands of Products in Many Fields

VOLUME XV

Editor-in-Chief
H. BENNETT, F.A.I.C.
Director, B. R. Laboratory
(Formula Consultants)
Miami Beach, Florida, 33140

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PREFACE TO VOLUME XV

This volume contains formulas collected in 1968. The only repetitious formulas are these in the Introduction (Chapter 1) which are given for those who have no technical training and experience in compounding. These will serve as a guide for beginners and students. They should read the introduction carefully and even make a few preparations before attempting more complicated formulas that follow.

H. BENNETT

NOTE: All the formulas in Volumes I to XV (except in the introduction) are different. Thus, if you do not find what you want in this voume, you may find it in one of the others.

NOTE: This book is the result of cooperation of many chemists and engineers who have given freely of their time and knowledge. It is their business to act as consultants and to give advice on technical matters for a fee. As publishers, we do not maintain a laboratory or consulting service to compete with them. Therefore, please do not ask us for advice or opinions, but confer with a chemist.

Formulas for which patent numbers are listed can be manufactured only after obtaining a license from the patentees.

PREFACE

Chemistry, as taught in our schools and colleges, concerns chiefly synthesis, analysis, and engineering — and properly so. It is part of the right foundation for the education of the chemist.

Many a chemist entering an industry soon finds that most of the products manufactured by his concern are not synthetic or definite chemical compounds, but are mixtures, blends, or highly complex compounds of which he knows little or nothing. The literature in this field, if any, may be meager, scattered, or obsolete.

Even chemists with years of experience in one or more industries spend considerable time and effort in acquainting themselves with any new field which they may enter. Consulting chemists similarly have to solve problems brought to them from industries foreign to them. There was a definite need for an up-to-date compilation of formulae for chemical compounding and treatment. Since the fields to be covered are many and varied, an editorial board of chemists and engineers engaged in many industries was formed.

Many publications, laboratories, manufacturing firms, and individuals have been consulted to obtain the latest and best information. It is felt that the formulae given in this volume will save chemists and allied workers much time and effort.

Manufacturers and sellers of chemicals will find, in these formulae, new uses for their products. Nonchemical executives, professional men, and interested laymen will make through this volume a "speaking acquaintance" with products which they may be using, trying, or selling.

It often happens that two individuals using the same ingredients in the same formula get different results. This may be due to slight deviations in the raw materials or unfamiliarity with the intricacies of a new technique. Accordingly, repeated experiments may be

necessary to get the best results. Although many of the formulae given are being used commercially, many have been taken from the literature and may be subject to various errors and omissions. This should be taken into consideration. Wherever possible, it is advisable to consult with other chemists or technical workers regarding commercial production. This will save time and money and help avoid trouble.

A formula will seldom give exactly the results which one requires. Formulae are useful as starting points from which to work out one's own ideas. Also, formulae very often give us ideas which may help us in our specific problems. In a compilation of this kind, errors of omission, commission, and printing may occur. I shall be glad to receive any constructive criticism.

H. BENNETT

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ABBREVIATIONS

amp ..... ampere
amp /dm^2 ..... amperes per square decimeter
amp /sq ft ..... amperes per square foot
anhydr ..... anhydrous
avoir ..... avoirdupois
bbl ..... barrel
Bé ..... Baumé
B.P. ..... boiling point
°C ..... degrees Centigrade
cc ..... cubic centimeter
c d ..... current density
cm ..... centimeter
cm_3 ..... cubic centimeter
conc ..... concentrated
c.p. ..... chemically pure
cp ..... centipoise
cu ft ..... cubic foot
cu in. ..... cubic inch
cwt ..... hundredweight
d ..... density
dil ..... dilute
dm ..... decimeter
dm^2 ..... square decimeter
dr ..... dram
E ..... Engler
°F ..... degrees Fahrenheit
f f c ..... free from chlorine
f f p a ..... free from prussic acid
fl dr ..... fluid dram
fl oz ..... fluid ounce
fl pt ..... flash point
F.P. ..... freezing point
ft ..... foot
ft^2 ..... square foot
g ..... gram

ABBREVIATIONS

gal.....gallon
gr.....grain
hl.....hectoliter
hr.....hour
in.....inch
kg.....kilogram
l.....liter
lb.....pound
liq.....liquid
m.....meter
min.....minim, minute
ml.....milliliter (cubic centimeter)
mm.....millimeter
M.P.....melting point
N.....Normal
N.F.....National Formulary
oz.....ounce
*p*H.....hydrogen-ion concentration
p.p.m.....parts per million
pt.....pint
pwt.....pennyweight
q.s.....a quantity sufficient to make
qt.....quart
r.p.m.....revolutions per minute
sec.....second
sp.....spirits
Sp. Gr.....specific gravity
sq. dm.....square decimeter
tech.....technical
tinc.....tincture
tr.....tincture
Tw.....Twaddell
U.S.P.....United States Pharmacopeia
v.....volt
visc.....viscosity
vol.....volume
wt.....weight

CHAPTER I

INTRODUCTION

The following introductory matter has been included at the suggestion of teachers of chemistry and home economics.

This section will enable anyone, with or without technical education or experience, to start making simple products without any complicated or expensive machinery. For commercial production, however, suitable equipment is necessary.

Chemical specialties are composed of pigments, gums, resins, solvents, oils, greases, fats, waxes, emulsifying agents, dyestuffs, perfumes, water, and chemicals of great diversity. To compound certain of these with some of the others requires definite and well-studied procedures, any departure from which will inevitably result in failure. The steps for successful compounding are given with the formulae. Follow them rigorously. If the directions require that (*a*) is added to (*b*), carry this out literally, and do not reverse the order. The preparation of an emulsion is often quite as tricky as the making of mayonnaise. In making mayonnaise, you add the oil to the egg, slowly, with constant and even stirring. If you do it correctly, you get mayonnaise. If you depart from any of these details: If you add the egg to the oil, or pour the oil in too quickly, or fail to stir regularly, the result is a complete disappointment. The same disappointment may be expected if the prescribed procedure of any other formulation is violated.

The point next in importance is the scrupulous use of the proper ingredients. Substitutions are sure to result in inferior quality, if not in complete failure. Use what the formula calls for. If a cheaper