THE CHEMICAL FORMULARY

BENNETT

VOL. XII

CHEMICAL PUBLISHING

The Chemical Formulary

A Collection of Valuable, Timely, Practical, Commercial Formulae and Recipes for Making Thousands of Products in Many Fields of Industry

VOLUME XII

Editor-in-Chief

H. BENNETT, F.A.I.C.

Director, B. R. Laboratory
Miami Beach, Florida

1965

CHEMICAL PUBLISHING CO., INC.

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PREFACE TO VOLUME XII

This new volume of the CHEMICAL FORMULARY series is a collection of new, up-to-date formulae. The only repetitious material is the introduction (Chapter I) which is used in every volume for the benefit of those who may have bought only one volume and who have no educational background or experience in chemical compounding. The simple basic formulae and compounding methods given in the introduction will serve as a guide for beginners and students. It is suggested that they read the introduction carefully and even make a few preparations described there before compounding the more intricate formulae included in the later chapters.

The list of chemicals and their suppliers has been enlarged with new trade-mark chemicals, so that buying the required ingredients will present no problem.

Grateful acknowledgement is made to the Board of Editors for their valuable suggestions and contributions.

H. BENNETT

NOTE: All the formulae in volumes I, II, III, IV, V, VI, VII, VIII, IX, X, XI, XII (except in the introduction) are different. Thus, if you do not find what you are looking for in this volume, 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.

Formulae 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

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