

**EXERCISES IN CHEMISTRY,
SYSTEMATICALLY ARRANGED TO
ACCOMPANY MCPHERSON AND
HENDERSON'S, ELEMENTARY
STUDY OF CHEMISTRY**

Published @ 2017 Trieste Publishing Pty Ltd

ISBN 9780649155606

Exercises in chemistry, systematically arranged to accompany McPherson and Henderson's, elementary study of chemistry by William McPherson & William Edwards Henderson

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WILLIAM MCPHERSON & WILLIAM EDWARDS HENDERSON

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EXERCISES IN CHEMISTRY

SYSTEMATICALLY ARRANGED TO ACCOMPANY

McPHERSON AND HENDERSON'S
ELEMENTARY STUDY OF CHEMISTRY

BY

WILLIAM McPHERSON, Ph.D.

AND

WILLIAM EDWARDS HENDERSON, Ph.D.

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GINN & COMPANY

BOSTON · NEW YORK · CHICAGO · LONDON

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The Athenaeum Press
GINN & COMPANY, PROPRIETORS · BOSTON · U.S.A.

PREFACE

The exercises contained in this book are systematically arranged to accompany McPherson and Henderson's *An Elementary Study of Chemistry*. The authors believe that the course in chemistry for secondary schools should consist of three recitations and two laboratory periods weekly for one year, and that the laboratory periods should consist of two consecutive recitation hours of at least forty-five minutes each. In accordance with this view an effort has been made to have the exercises of such length that each can be completed in one and one-half hours.

It is no longer necessary to emphasize the importance of laboratory work as a part of the course in elementary chemistry, since it is universally admitted that some laboratory experience is essential for a thorough comprehension of the subject. It is none the less true, however, that laboratory work is of very doubtful value unless carefully directed by an experienced teacher toward some definite end. It is in the hope of aiding such a teacher that this little exercise book has been prepared.

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INFORMATION REGARDING APPARATUS AND CHEMICALS

The lists following include the apparatus and chemicals required for the experiments in this notebook. It is always best to furnish each student with as complete an outfit as possible and to hold him responsible for the same. Certain pieces may, however, be used in common by a number of students and these have been placed in a separate list. It is always cheapest to purchase the apparatus and chemicals in as large quantities as possible. The amounts of most of the chemicals needed for a class of ten are so small that the cost of the same will be proportionately much greater than when larger quantities are ordered. It is always best to order the definite amounts of chemicals listed in the catalogues, such as 100 g. or 1 lb. The supplies may be obtained from any of the large dealers. The following are the addresses of some of the largest firms. Catalogues will be sent on application and should be in every school.

Eimer & Amend, 205 Third Avenue, New York City.

The Bausch & Lomb Optical Company, Rochester, N.Y.

The Arthur H. Thomas Company, Twelfth and Walnut Streets, Philadelphia, Pa.

E. H. Sargent & Co., 145 Lake Street, Chicago, Ill.

The C. H. Stoeltling Company, 45 West Randolph Street, Chicago.

A list of the supplies needed should be sent to a number of firms for quotation on prices. In ordering any piece of apparatus a certain form in some catalogue should be designated; otherwise it will be impossible to compare the prices. In general it is best to purchase as simple a form of apparatus as possible; for example, 20 cents will buy a Bunsen burner which for ordinary purposes is preferable to those costing \$1.00. In the case of large orders a considerable saving may be made by placing the order four or five months early and requesting the dealer to import duty free such articles as can be obtained in this way at a less cost. A much higher price will have to be paid for small orders placed for immediate delivery. A person experienced in the purchase of supplies will always find it possible to materially reduce the cost of the order. The authors will be glad to correspond with teachers in regard to any questions that may arise in the purchase of their supplies or the equipment of laboratories in general.

APPARATUS REQUIRED FOR EACH STUDENT

| | APPROXIMATE COST |
|--|---------------------|
| Beakers, nest of 7, 100 cc. to 700 cc. | \$0.00 |
| Blowpipe | .10 |
| Bottles. Wide mouthed, 1 (60 cc.), 5 (250 cc.) | .10 |
| Bunsen burner | .20 |
| Burner, wing top for bending glass tubing | .10 |
| Calcium chloride drying tube, straight, 15 cm. in length | .10 |
| Clamp, iron burette | .25 |
| Clamp, screw | .10 |
| Clay pipe | .01 |
| Deflagrating spoon | .15 |
| Dish, evaporating, diameter about 7.5 cm. | .20 |
| Dish, hemispherical iron, diameter about 8 cm. | .05 |
| Dish, lead, diameter about 6 cm., 3 cm. in depth | .05 |
| File, round, about 15 cm. in length | .05 |
| File, triangular, about 15 cm. in length | .10 |
| Filters, 25, diameter about 11 cm. | .05 |
| Flasks, 2 (250 cc.), 1 (500 cc.) | .50 |
| Funnel, diameter about 6.5 cm. | .10 |
| Funnel tube, external diameter of tube, 6 mm. | .10 |
| Glass tubing, 100 g., soft, external diameter 6 mm., walls 1 mm. thick | .10 |
| Glass tubing, hard, 1 piece, 30 cm. in length, internal diameter 1 cm. | .06 |
| Glass tubing, hard, 1 piece, 20 cm. in length, internal diameter 6 mm. | .05 |
| Glass rod, 2 pieces, 15 cm. in length, diameter 3 mm. | .05 |
| Mortar, porcelain, diameter about 8 cm. | .40 |
| Porcelain crucible and lid, diameter about 3.5 cm. | .10 |
| Retort, glass stoppered, 150 cc. | .25 |
| Ring stand and rings | .40 |
| Rubber tubing, 1 piece, 75 cm. in length for Bunsen burner, internal diameter 6 mm. | .15 |
| Rubber tubing, 1 piece, 60 cm. in length for connections, etc., internal diameter 5 mm. | .10 |
| Splints, 1 package | .01 |
| Test tubes, 12, 12 cm. in length, diameter about 1.7 cm. | .15 |
| Test tube, graduated, 30 cc. | .25 |
| Test tube, hard glass, preferably Jena glass, 15 cm. in length, diameter about 1.8 cm. | .05 |
| Test tube rack | .20 |