DIRECTIONS FOR CLASS WORK IN PRACTICAL PHYSIOLOGY, ELEMENTARY PHYSIOLOGY OF MUSCLE AND NERVE AND OF THE VASCULAR AND NERVOUS SYSTEMS

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Directions for Class Work in Practical Physiology

ELEMENTARY PHYSIOLOGY OF MUSCLE AND
NERVE AND OF THE VASCULAR
AND NERVOUS SYSTEMS

BY

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WITH DIAGRAMS

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PREFACE

The following directions are based upon an experience of many years in University College, London, where such a course of instruction was first instituted by Professor Burdon-Sanderson. Although they have long been in use I have now had them printed for the convenience of my Edinburgh students. There are several text-books dealing with the same subject, but they are all more elaborate, and concern themselves with many problems which the average medical student cannot be expected to investigate for himself. On this account perfectly simple instructions dealing only with such elementary exercises as can readily be worked out by even a large class, may, it is hoped, prove useful to other teachers and students than those for whom they are primarily intended.

Practical Physiology

CHAPTER I.

Batteries.—A voltaic element or cell usually consists of two metals—*e.g.*, zinc and copper—immersed in a fluid such as dilute sulphuric acid, and the changes (movements of ions) which occur under these circumstances in the fluid produce a disturbance of electrical equilibrium in the cell which manifests itself as a difference of electrical potential or pressure at the metals. If wires are connected to these it is found that the end of the wire connected with the copper or negative metal is charged with positive electricity, and that connected with the zinc or positive metal is charged with negative electricity; these ends are called the positive pole, or *anode*, and the negative pole, or *kathode*, respectively. The anode is said to be in a condition of higher potential and the kathode in one of lower potential, and when they are joined electrical equilibrium tends to re-establish itself in the circuit thus closed. It is common to speak of a current as flowing from the anode to the kathode outside the battery and from the zinc to the copper inside.[1] The amount of this current depends upon the difference of potential produced within the cell. This is diminished by any increase of resistance to the flow of electricity whether occurring within the cell or in the outside circuit. Electromotive force (E.M.F.) is measured in volts; thus the E.M.F. of a Daniell cell is 1.079 volts.

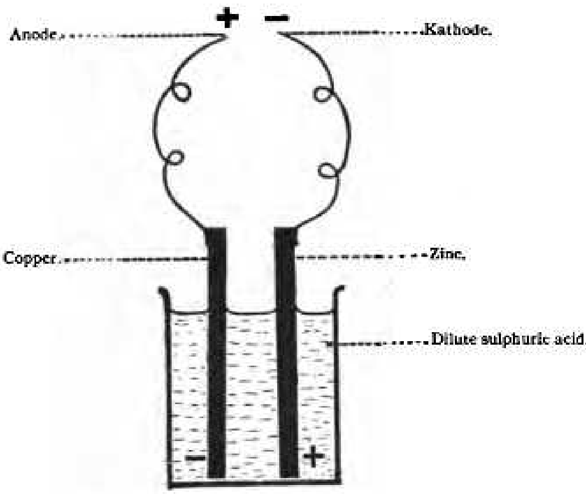

FIG. 1.—VOLTAIC COUPLE.

It may be increased by coupling two or more cells together in series, the zinc of one connected with the copper of the next, and so on.

If electricity be generated simply by immersing plates of zinc and copper into acid the chemical action which ensues causes bubbles of hydrogen

[1] *Within the battery* the electrical potential is highest at the zinc, which is therefore here the anode, and lowest at the copper, which is here the kathode.

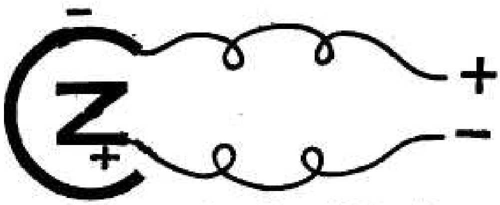

FIG. 2.—DIAGRAM OF A VOLTAIC COUPLE. Z, ZINC; C, COPPER.

gas to form on the copper, and this not only introduces a resistance to the flow of current through the cell, but the hydrogen being electropositive tends to set up a current (polarisation current) in the opposite direction in the cell and circuit; from both these causes the original E.M.F. of the cell becomes rapidly weakened.

To obviate this effect Daniell placed the copper

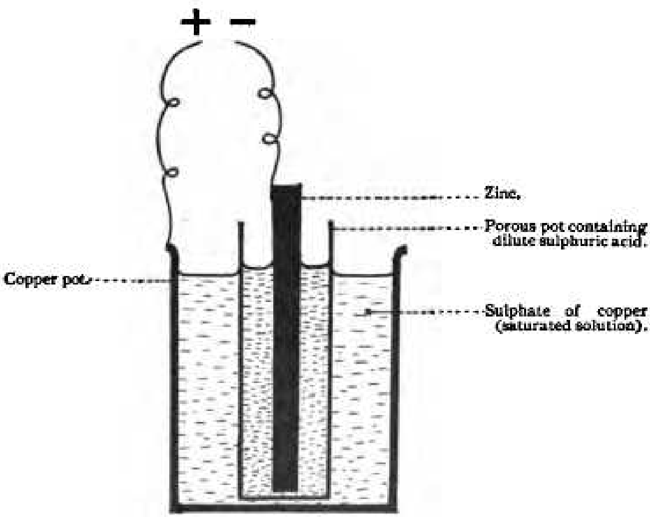

FIG. 3.—DANIELL CELL.