the relative degrees of brightness at these times are 1, ⅔, and ⅓, and assuming that the eclipses are central, it is easily shown that the observed magnitudes may be explained by supposing that the two components are of equal size, while one is twice as bright as the other. The unequal duration of the minima further indicates that the orbit is an ellipse with an eccentricity of 0·2475, and it is calculated that the semi-axis major of the orbit is six times the diameter of the stars. The plane of the orbit passes through the sun, and the line of apsides is inclined at an angle of 4° to the line of sight. The stars revolve in this orbit in a period of 3 days 23 hours 48 minutes 30 seconds.

It seems probable that this variable may form a connecting link between Algol, which consists of a bright and a dark body, and Y Cygni, consisting of two stars of equal brightness.

THE DIAMETER OF NEPTUNE.—With the Lick telescope and an eyepiece magnifying 1000 diameters, Prof. Barnard finds the mean angular diameter of Neptune, when reduced to the mean distance from sun 30·0551, to be 2″·433. This corresponds to an actual diameter of 32,900 miles, which is from two to four thousand miles less than that stated in most of our textbooks.—*Astronomical Journal*, No. 342.

INDUCED MAGNETISM IN VOLCANIC ROCKS.

AN interesting note by G. Folgheraiter, on the magnetism induced in volcanic rocks by the earth's magnetic field, appears in the *Atti della Reale Accademia dei Lincei* (vol. iv. part 5, March 3, 1895). The author has performed a number of experiments on volcanic rocks, in order to determine the amount of induced magnetism left when, after heating to such a temperature that they entirely lose their permanent magnetism, they are either allowed to cool slowly or are suddenly cooled, in each case under the influence of the earth's field. From such observations he hopes to be able to deduce some conclusions as to the conditions under which the rocks experimented on, which were originally permanently magnetised, became magnetised. The rocks are cut into small parallelopepedons weighing about 50 grams, and such that the length is about two or three times the depth or breadth, care being always taken to cut the rock so that the axes of these pieces were vertical when the rock was in its place in the earth. The intensity of magnetisation was in every case measured by the method of deflection ; a freely suspended magnetic needle being deflected by the sample, which was placed with its length east and west. After measuring the intensity of magnetisation of the samples, they were heated to redness, and then either allowed to cool slowly, or are rapidly quenched with their axes vertical. Their magnetic moment was determined, first immediately they were cool, and then after they had stood under the influence of the earth's field for three months. The specimens of basalt examined may be divided into two groups : in the first may be placed those specimens which were originally only slightly magnetised, and in this case, after heating to redness, the magnetisation is always increased, but to a very different degree in the different specimens. The second group includes those basalts which were originally strongly magnetised, and in this case after heating the magnetisation was considerably reduced. In both groups the magnetisation underwent no change during three months, and sudden cooling gave the same results as slow cooling. Experiments have also been made on tuff and peperino. The results obtained with the first of these rocks are similar to those obtained with the first group of basalts. Peperino, however, differs in that, before being heated, its coercive force seems almost nil, the bar becoming only temporarily magnetised. After heating, the character of the rock is altered, as it can now become permanently magnetised and behaves just like the tuff. From this the author concludes that peperino has been formed at a low temperature, probably by the action of water on cinders, &c.

THE FREEZING-POINT OF DILUTE SOLUTIONS.

CORRECT determinations of the freezing-point of dilute solutions are of fundamental importance in connection with the general theory of the subject, and it is therefore anything but satisfactory to find that, in spite of the closeness with which the individual results of the same observer agree amongst themselves, the results of different observers are in many cases

widely separated. For example, the following values have been given as the molecular depression of the freezing-point in the case of a 1 per cent. aqueous solution of sugar :— 2·02, Arrhenius ; 2·07, Raoult ; 2·01, Pickering ; 2·18, H. C. Jones ; 1·81, Loomis. The results of Jones and Loomis, both of whom claim increased accuracy for the methods they employ, differ by some 18 per cent. The theoretical value of the molecular depression, calculated from the melting-point and heat of fusion of ice, is 1·86. The cause of these differences has given rise to much discussion. Pickering has attempted to show that Jones's results, wherein the temperature was read to the ten-thousandth of a degree, were affected by thermometer errors. Jones has replied that his thermometer was tested. Kohlrausch has drawn attention to probable sources of error in Jones's method, but is compelled to admit that the differences between the results of Jones and Loomis must, in the main, be due to some unknown source of error.

A definite step in the direction of clearing up this point is made in a recent number of the *Zeitschrift für physikalische Chemie*. Here Nernst and Abegg emphasise the fact that the observed freezing-point must in general be different from the true freezing-point, or the temperature at which solid and liquid are in equilibrium. They point out that a partly-frozen liquid, uninfluenced by the temperature of its surroundings, will strive to reach the true freezing-point at a rate which, at any instant, may be taken as proportional to the difference between its actual temperature and the true freezing-point. Again, in practice, on account of the limited amount of substance employed, and the effect of the temperature of the surroundings, &c., unfrozen liquid strives to reach a definite temperature, which may be termed the "convergence temperature." On these assumptions it is easy to show that the observed freezing-point, or the temperature at which the thermometer becomes steady, will only be the true freezing-point if the "convergence temperature" is equal to the true freezing-point, or if R, the rate at which the temperature of the partly frozen liquid approaches the freezing-point, is infinitely great as compared with r, the rate at which the temperature of the unfrozen liquid approaches the "convergence temperature." If one of these conditions is not fulfilled, corrections determined experimentally have to be applied. For dilute solutions of alcohol and common salt the corrections were found to be inappreciable under the experimental conditions described in the paper. Here the value obtained for R, although, as is always the case, it was largely diminished by the lag of the thermometer, still was sufficiently large as compared with the value of r. In the case of sugar, however, R was so small that by varying the experimental conditions, a 1 per cent. solution gave molecular depressions varying between 1·6 and 2·1—limits which are even further apart than those given by the results of previous observers. On correcting the observed depressions in the manner described, they all gave practically the theoretical value.

Without these corrections, observed freezing-points are thus held to be functions of the size of the apparatus used, the temperature of the cooling-bath, the rate of stirring which largely affects the "temperature of convergence," &c.

Evidence is also given of the futility of expressing freezing-points to the ten-thousandth of a degree. It may readily happen that the above correction is as high as 0°·01, and as the mode of deducing it is but approximate, in such a case 0°·001 or 0°·002 would be a favourable estimate of the error of the end result, even if satisfactory corrections could be applied for the alteration in the concentration of the solution produced by freezing, and the ordinary sources of error incidental to the method of experiment.

J. W. RODGER.

THE EXAMINATION CURVE.

IF the results of the examination of a mixed body of candidates be plotted out on the graphic method, they will be found, in accordance with a well-known law of statistics, to approximate to a curve having a more or less rapid gradient at either end, and a mid-region of gentler ascent. Fig. 1, for example, shows the results of an examination of 27 students in physical geography, the scale of marks running vertically from 10 to 90, the examinees being arranged horizontally at equal distances apart from the lowest to the highest. The larger the number of candidates the more flattened does the mid-region of the curve tend to become. Again, in any series of examinations, the mean results of which are plotted out, the more uniform