

THE EXAMINATIONS FOR CLASS I. OF  
THE CIVIL SERVICE.

IN November last a Treasury committee was appointed to consider and report upon the scheme of examination for Class I. of the Civil Service. The committee consisted of Mr. Stanley Leathes, C.B., First Civil Service Commissioner (chairman); Sir Alfred Ewing, K.C.B., Vice-Chancellor of the University of Edinburgh; Sir Henry Alexander Miers, Vice-Chancellor of the University of Manchester; Mr. H. A. L. Fisher, Vice-Chancellor of the University of Sheffield; Prof. W. G. S. Adams, Gladstone professor of political theory and institutions in the University of Oxford; and Mr. D. B. Mair, M.A., director of examinations to the Civil Service Commissioners, to be secretary to the committee.

Mr. Fisher resigned his membership of the committee on his appointment as President of the Board of Education, and Dr. W. H. Hadow, principal of Armstrong College, Newcastle, and Vice-Chancellor of Durham University, was appointed in his stead.

The committee was instructed "to consider and report upon the existing scheme of examination for Class I. of the Home Civil Service;

"To submit for the consideration of the Lords Commissioners of his Majesty's Treasury a revised scheme such as they may judge to be best adapted for the selection of the type of officer required for that class of the Civil Service, and at the same time most advantageous to the higher education of this country;

"And in framing such a scheme, to take into account, so far as possible, the various other purposes which the scheme in question has hitherto served, and to consult the India Office, the Foreign Office, and the Colonial Office as to their requirements, in so far as they differ from those of the Home Civil Service."

The report of the committee, dated June 20, 1917, has now been published (Cd. 8657), and the outstanding points of the new scheme proposed for the examinations of the future are printed below. We hope next week to deal with the report as a whole.

SCHEME PROPOSED BY THE COMMITTEE.

This scheme should be established on a basis of equality of studies; that is, of the chief studies which are pursued by students at the university up to the conclusion of an honours course. We propose to place on an equal footing the main schools of: Classical languages, history, and literature; modern languages, with history and literature; history; mathematics; and the natural sciences. The classical subjects will be valued at 800 marks; history and mathematics at the same; candidates in natural science taking one main subject up to the higher level and two subsidiary subjects on the lower level can obtain the same totals; while two modern languages studied as comprehensively as the classics will be worth the same. It is possible, however, that for some time candidates able to take full advantage of this last opportunity may be few. We propose that the candidate coming from any one of these schools shall be encouraged—it might almost be said constrained by the force of competition—to offer one or two other additional subjects estimated by us as the equivalent of one-fourth part of his whole main subject. This addition, valued at 200 marks, may be made up in many ways, and we do not propose to limit in any way the free choice of candidates. There is also a great range of university studies—political, legal, economic, and philosophical—which have not been as yet, so far as we know, consolidated into one honours school, though the courses offered by the London School of Economics may cover the most part of them. We have greatly increased the individual and collective weight of these studies,

but we do not consider it desirable that candidates for the Civil Service should study exclusively either politics, law, economics, or philosophy; however, for students whose chief interest lies in two or more of these subjects we offer a varied field of selection which is fully equivalent to that appertaining to any of the schools mentioned above.

While grouping subjects as above, and expecting that on the whole the main choice of candidates will be in one or other of the groups, we retain for subjects of university study the old freedom of selection. Whatever limits we imposed upon the choice of candidates, we should still be confronted by the difficulty of equating disparate subjects; e.g. language including literature and history, mathematics, history, natural sciences. That difficulty has to be solved as best it may by the Civil Service Commissioners and their permanent and occasional staff. It will be no greater under our proposed scheme than it is under the existing scheme. Moreover, we think it would be difficult to make up a list of subjects under our proposed scheme which would not secure a useful university education, either narrower or wider.

But we do not consider it necessary to confine our tests to the results of university study alone. The young men who will be examined by the Civil Service Commissioners will have spent not only three or four years at the university, but ten or more years at school; and the best of them will have had abundant leisure in which to educate themselves and pick up knowledge and accomplishments useful to them in the work of life. Much that they have learnt at school they will quite rightly have forgotten, but that knowledge should have served its purpose; and we do not propose to examine our candidates in school subjects. But we consider that a sound and systematic education should show certain results at university-leaving age; and that candidates who, while devoting themselves to their individual studies, have nevertheless retained an alert and acquisitive mind and have kept their eyes open to the most important facts in the world around them, should have seized and retained a certain amount of knowledge—scientific, economic, and political. We consider it also highly desirable that all Civil Servants should have a good working knowledge—that is, a reading and translating knowledge—of at least one modern foreign language, preferably two.

On this basis we have constructed a separate section that all candidates must take. We consider that all well-educated young men should be able to use the English language skilfully and accurately and to grasp its meaning readily and correctly. This accomplishment is specially valuable for Civil Servants, but any form of education that has not developed it has failed in a principal part of its purpose. We therefore propose in the first place that all candidates should write an essay. To construct an essay and work out therein a line of thought with suitable words, logical order, and just proportions is a severe criterion of ability. But it is found by experience that an excellent candidate may on any one occasion fail to do justice to his powers. We therefore propose that candidates should have in other papers opportunities of manifesting like powers of arrangement and effective expression. One of these papers should be a test in English (Section A, subject 2), the nature of which may best be understood by reference to the specimen paper supplied.

Further, we propose a paper in modern subjects, social, political, and economic. A specimen paper is supplied. It may be found that many—perhaps most—young men of our country are unduly ignorant of such matters. But the existence of this test should encourage many to turn their attention to these subjects and accumulate in their leisure much useful information. It should be noted throughout this Sec-

tion A that no candidate will be disqualified for failure in any part, or in the whole of the section, though, since we allow 500 marks for the written part of the section, there is much advantage to be gained or lost thereby in the whole competition.

We have received from the Government Committee on Science in the Educational System of Great Britain the following resolution:—

“The committee has had under its consideration certain proposals for remodelling the Competitive Examination for admission to Class I. of the Civil Service at home and in India or in the Colonies. It is unanimous in thinking that it is indispensable that a course in science extending over several years shall have formed a serious part of every candidate's previous education. It is, however, not prepared to trespass on the province of the committee which is dealing in detail with this examination. It feels strongly that if the men with high scientific qualifications who will undoubtedly be needed in the Service to a greater or less extent are to be secured at a comparatively early age by this examination, then candidates offering science only (without mathematics) should in future be placed on complete equality with other candidates, and that this is not the case at present. But it recognises that there may be advantages in obtaining also by other methods scientific advisers for the Service at a greater age and with practical professional education.”

With the trend of this resolution we find ourselves in general agreement; and we desire to make it clear that by placing science, as we have endeavoured to do, on a complete equality with other subjects of a university course, we do not expect to make it possible for certain departments to dispense with scientific advisers selected in maturer age and possessed of practical experience and of knowledge of a kind that may have to be obtained elsewhere than at a university. And in some departments specialists in one or another branch of science will doubtless be selected by tests of a less general kind than that with which we are concerned. The young men selected under our scheme partly for their knowledge of natural science, unless they happen to be employed in a scientific branch of the department in which they are working, may have no opportunity of exercising their scientific acquirements and their knowledge may pass out of date. They should, however, not lose a just estimate of scientific knowledge, and they should know when and where it may with advantage be sought.

We must, however, make one reservation to the terms of this resolution. The “indispensable” requirement of a school course in science must apply rather to the future than to the present. We cannot now correct the defective education of the past or rule out from our competition for some years to come all those useful candidates who may not satisfy this demand of the Science Committee. Perhaps later it may be possible to require of all candidates some form of school certificate which may be evidence of suitable training in this and some other subjects not tested by the examination.

However, we think we may even now go so far as this. We can give a substantial advantage in the competition to those candidates who by whatever means have obtained and retained a sound knowledge of some of the principles, methods, and applications of science, and are able to give a lucid and intelligent account of their knowledge. [Specimen questions are supplied.] It is hoped that the inclusion of this subject in the scheme will encourage all candidates to make themselves acquainted with the general principles of science. This paper will also be a test of orderly, effective, and exact expression.

Finally, we propose to allot 100 marks for a trans-

lation paper from some modern foreign language. We intend this paper to be a serious test of capacity to understand and translate accurately passages from the foreign language. We do not propose to limit the scope; verse may be set as well as prose; but nothing that is antiquated should appear; the candidate should be able to master any passage that is likely to occur in books of ordinary difficulty written in the living tongue; passages dealing with history and politics may be set, but not any technical matter. This should be not only a test of specific knowledge, but also a test of capacity to use the English language with skill and accuracy. The languages mentioned in our list are those which appeared to us most likely among European languages to afford information useful to students or to Civil Servants, or to both. We include Latin as an option for those candidates who take two modern languages because Latin is commonly imposed at school upon those pupils who take modern languages, and we do not wish to lay any unnecessary burden on the modern language candidates. In any case, for candidates who have mastered two languages, classical or modern, there should be no hardship and much advantage in acquiring a third.

Since it is of high importance that Civil Servants should have ready use of two modern languages, we include among our recommendations that any candidate who wishes to offer a second modern language on the same terms as in Section A should be permitted to do so beyond the limit of the subjects prescribed in Section A and those permitted in Section B. To acquire a modern language for reading and translation purposes should not be a difficult task for any well-educated man; it can be done in leisure time with a little assistance. But some adequate motive is needed to induce the effort; an effort which should be made by students of history, natural science, politics, economics, and, indeed, of almost all the subjects in our schedule, but, in fact, is not always made. We trust that in course of time all our candidates will be prepared to offer two modern languages up to a useful standard, but we do not at present propose to make two compulsory. We hold out an advantage to those who offer two, but success will be possible with only one, and in some cases perhaps without any.

VIVA VOCE EXAMINATION.—The Royal Commission expressed a cautious inclination towards a *viva voce* examination, but made no definite recommendation. The Consultative Committee in its report says that there should be a *viva voce* examination. On this point, as on almost every point of our report, we are unanimous. We believe that qualities may be shown in a *viva voce* examination which cannot be tested by a written examination, and that those qualities should be useful to public servants. It is sometimes urged that a candidate—otherwise well qualified—may be prevented by nervousness from doing himself justice *viva voce*. We are not sure that such lack of nervous control is not in itself a serious defect, nor that the presence of mind and nervous equipoise which enable a candidate to marshal all his resources in such conditions is not a valuable quality. Further, there are undoubtedly some candidates who can never do themselves justice in written examinations, just as there are others who, under the excitement of written competition, do better than on ordinary occasions. We do not consider that it is desirable to forgo the *viva voce* test for the advantage of a few weak vessels. We consider that the *viva voce* can be made a test of the candidate's alertness, intelligence, and intellectual outlook, and as such is better than any other. The *viva voce* examination has been proved by experience to redress in certain cases the results of written examination. The examination should, of course, be skilfully conducted by carefully selected examiners accustomed

to handle young men and to put them at their ease. We consider that the *viva voce* examination should not be in matters of academic study, but in matters of general interest, on which every young man should have something to say. We think that the marks assigned under this heading should be a valuable corrective to the results of the written papers, and should not infrequently help a useful man to success or save the State from a bad bargain.

LIMITS OF AGE.—We propose no change in the limits of age, which are at present not less than twenty-two nor more than twenty-four on August 1 in the year in which the competition is held. Under existing practice the examination begins on August 1 or on August 2 if the 1st is a Sunday. We consider this time of year convenient for university candidates.

SCHEME OF EXAMINATION PROPOSED BY THE COMMITTEE.  
SECTION A.

To be taken by all Candidates.

	Marks
1. Essay ... ..	100
2. English ... ..	100
3. Questions on contemporary subjects, social, economic, and political ...	100
4. Questions on general principles, methods, and applications of science ...	100
5. Translation from one of the following languages not taken in Section B, viz. French, German, Spanish, Italian, Portuguese, Dutch, Norwegian, Swedish, Danish, Russian; Latin being also an option for those who take two modern languages in B ...	100
6. A <i>viva voce</i> examination... ..	300
Total for Section A ... ..	800

This section is intended to test the candidates' knowledge of the English language and their capacity for its skilful use, their accurate command of knowledge which they should have acquired in the course of a systematic education and self-education, and should have retained to assist them in their future work, and their equipment in one foreign language at least for working purposes. The languages selected are those most likely to afford information useful to public servants. As circumstances change others should be added at the discretion of the Civil Service Commissioners.

The *viva voce* should be a test, by means of questions and conversation on matters of general interest, of the candidate's alertness, intelligence, and intellectual outlook, his personal qualities of mind and mental equipment.

It is not intended that any candidate should be disqualified for failure in any of the parts of this section or in the section as a whole, but that the section should count substantially in the competition.

SECTION B.

Optional Subjects.

Candidates to be allowed to take up subjects in this section up to a total of 1000 marks.

Languages with History and Literature.

	Marks
7. Latin, translation, and prose or verse composition ... ..	200
8. Roman history and Latin literature ...	200
9. Greek, translation, and prose or verse composition ... ..	200
10. Greek history and literature ... ..	200
11. French, translation, free composition, set composition, and conversation ...	200
12. French history and literature ... ..	200

	Marks
13. German, translation, free composition, set composition, and conversation ...	200
14. German history and literature ... ..	200
15. Spanish <sup>1</sup> or Italian, <sup>1</sup> translation, free composition, set composition, and conversation ... ..	200
16. Spanish <sup>1</sup> or Italian <sup>1</sup> history and literature ... ..	200
17. Russian, <sup>1</sup> translation, free composition, set composition, and conversation ...	200
18. Russian <sup>1</sup> history and literature ... ..	200

The history and literature subject associated with each of these languages (7-18) can only be taken by candidates who also offer themselves for examination in the relevant language in Section B.

	Marks
19. English literature, 1350-1700 ... ..	200
20. English literature, 1660-1914 ... ..	200

History.

21. English history to 1660, social, economic, political, constitutional ...	200
22. British history, 1660-1914, social, economic, political, constitutional ...	200
23. European history, 1494-1763 ... ..	200
24. European history, 1763-1914 ... ..	200

Economics, Politics, Law, and Philosophy.

25. General economics ... ..	200
26. Economic history ... ..	100
27. Public economics, including public finance ... ..	100
28. Political theory ... ..	100
29. Political organisation ... ..	100
30. The Constitutional Law of the United Kingdom and of the British Empire, and the law of English local government ... ..	100
31. English private law ... ..	200
32. Roman law ... ..	100
33. Public international law and international relations ... ..	100
34. Moral philosophy ... ..	100
35. Metaphysical philosophy ... ..	100
36. Logic ... ..	100
37. Psychology ... ..	100

Mathematics and Science.

38. Mathematics, lower ... ..	400
39. Mathematics, higher ... ..	400
40. Astronomy ... ..	200
41. Statistics ... ..	100
42. Chemistry, lower ... ..	200
43. Chemistry, higher ... ..	200
44. Physics, lower ... ..	200
45. Physics, higher ... ..	200
46. Botany, lower ... ..	200
47. Botany, higher ... ..	200
48. Geology, lower ... ..	200
49. Geology, higher ... ..	200
50. Physiology, lower ... ..	200
51. Physiology, higher ... ..	200
52. Zoology, lower ... ..	200
53. Zoology, higher ... ..	200
54. Engineering ... ..	400
55. Geography .. ..	200
56. Physical anthropology, prehistoric archæology, and technology ... ..	100
57. Social anthropology ... ..	100
58. Agriculture ... ..	200
59. Experimental psychology ... ..	100

<sup>1</sup> Papers on these languages should only be prepared on evidence presented one year in advance and satisfactory to the Civil Service Commissioners that at least one candidate will present himself who is likely to be fit for examination on a standard equivalent to those in French and German.

A candidate desiring to offer any of the subjects 42-54 or 59 must produce evidence satisfactory to the Commissioners of laboratory training in an institution of university rank. For (40) astronomy, (41) statistics, (55) geography, (56) physical anthropology, etc., and (58) agriculture, other equivalent training will be required. There will be no laboratory test as a part of the examination.

#### Extra Numerum.

Candidates may take, in addition to the above, one of the translation papers of Section A in a language not already taken by them in that section, not more than one of the Scandinavian languages, nor more than one of the three, Spanish, Italian, Portuguese, being offered by the same candidate; for this 100 marks will be awarded, not included in the 800 of Section A or the 1000 of Section B.

### RADIO-ACTIVE HALOS.<sup>1</sup>

#### II.

WE shall now see that the thorium halo follows faithfully the same laws of development as the uranium halo, whatever we may assume as to the nature of these laws.

By plotting the seven  $\alpha$ -ray curves of ionisation which must contribute to the formation of a halo in the medium surrounding a particle containing the parent element thorium, and then, as before, adding up the ordinates, we get for the total ionisation responsible for the thorium halo the next curve (Fig. 6).

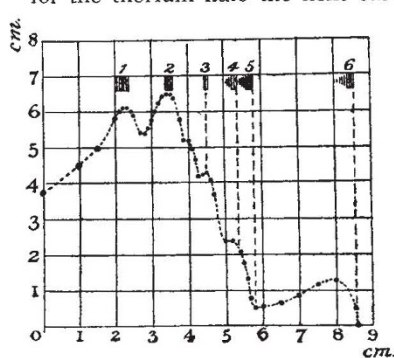


FIG. 6.—Integral curve for thorium halo.

Note that the single conspicuous maximum displayed by the corresponding curve for the uranium halo is now replaced by two maxima, the one which is nearer the centre being a little the lower. Beyond these two maxima the curve descends steeply with two excrescences before the

minimum of ionisation is reached. Then the curve reascends to the low maximum due to  $\text{ThC}_1$ .

Now, the first beginning of the thorium halo shows two rings, and the radial dimensions of these rings are in good agreement with the positions of the two maxima of the curve. The inner ring has not been found alone. Next we find the space within and around these rings growing darker, accompanied by the early appearance of the outer ring due to  $\text{ThC}_2$ , just as in the case of the uranium halo we observe the early appearance of the ring due to  $\text{RaC}_1$ . The next stage, so far certainly observed, shows the loss of the internal features, the resulting halo exhibiting much the same appearance as the uranium halo in the final stage of development.

Above the ionisation curve for the thorium halo I have marked the several features of the halo. The agreement of the observed with the theoretical features is even closer than in the case of the uranium halo.

When we consider the successive steps in the genesis of the radio-active halo, which I have now laid before you, we can only come to the conclusion that some

<sup>1</sup> Discourse delivered at the Royal Institution on Friday, May 11, by Prof. J. Joly, F.R.S. Continued from p. 458.

cause exists which tends to accentuate the effects going on in the outer regions of the halo. Could we assign a cause for the strengthening of the outer effects of ionisation, or, what comes to the same thing, for the weakening of the inner effects, every feature of the halo becomes explained by the curve of integral ionisation—that is, by the curve which simply sums the effects of the several Bragg curves. We would then find an explanation of the appearance of successive rings and of the appearance of the effects of the extreme or limiting ray at such an early stage of development.

If we assume that the process which results in the formation of a halo under the influence of the  $\alpha$  ray is essentially similar in nature to that which is responsible for the photographic image under the stimulus of light, the desired explanation of the weakening of the inner features is forthcoming. For the phenomenon of reversal or of solarisation, well known to photographers, would assuredly lead to the weakening of the inner parts of the image. The repetition of stimuli at or near the same spot is necessarily more marked in the inner than in the outer parts of the halo, and the ionisation accumulating in the region traversed by the external limiting  $\alpha$  rays is to a large extent exempt from the effects of repetition.

Now there are features in common between the halo image and the photographic image. Both are brought about by ionisation in a sensitive medium. There is so much indirect evidence for this view that we can scarcely doubt its truth. The salts of iron in many forms have been found to be photographically sensitive. In the photochemistry of chlorophyll they appear to play a fundamental part in Nature. Again, we may interpret the fact that the halo may be obliterated by heat, as proof of instability. Finally, the photographic plate is affected by the  $\alpha$  ray in a manner not readily distinguished from that due to light.

Halos have been found which show all the appearance of reversal. In them we find the penumbra replaced by a band which is darker than the region lying within. Normal halos in its neighbourhood, by contrast, well show the peculiar change which affects the reversed halo. It is the negative of a halo. What is this appearance due to, if not to reversal? The effect must arise from very intense ionisation. The reversal has cleared the inner pupil more or less, but the repetition of stimuli has not been sufficient to affect the penumbra in the same manner. If these views are correct we may claim to know something of the nature of the phenomena which lead to the building up of the halo. We may regard the radio-active nucleus as emitting, for countless ages, radiations which slowly act, according to the laws affecting the latent photographic image, upon the surrounding medium. We must suppose the electric charge upon the  $\alpha$  ray to affect the stability of the sensitive mineral, ionising the constituent atomic systems, and, finally, producing stresses and, possibly displacements, which are revealed in the increased colour absorption.

Hitherto I have more especially dwelt upon the points of agreement between the observed and the theoretical halo. I venture to think that the agreement sets beyond any doubt not only the radio-active origin, but also the general mode of development of halos. I shall now refer to some details in which the observed halo is not in perfect agreement with the curve of ionisation.

In the case of the thorium halo the measured dimensions of the halo are in very perfect accord with the ionisation curve. The agreement seems generally as perfect as we could expect. There is, however, a very small appearance of misfit in the location of the first ring. The estimates I have made of the radius of