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## Biology Curators Group Newsletter

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NOTES FOR  
DIPLOMA STUDENTS



The Diploma Practical Examination and the Biologist

This information is not appearing because biologists have greater problems than candidates in other disciplines, or because they have a pass rate any different from that of other colleagues. It simply happens that I have been afforded an opportunity to offer advice and help through the medium of the B.C.G. Newsletter and this I am happy to do.

The biologist does have one potential problem, since the examination is not for natural historians, but natural scientists, hence whether you are a zoologist or a botanist or both, you also have to be something of a geologist as well. As the practical examination is structured at present, though you can reduce the possible geological questions to one, you cannot escape the subject altogether. But, if we are expecting the museum natural historian also to have some facility for dealing with geological material, and few can get away without this need, then we should expect some evidence of an ability to deal intelligently with the minerals, rocks and fossils which can turn up in a museum.

It is important to establish from the beginning that the practical examination for the Museums Association Diploma is concerned almost exclusively with museum specimens. They may be specimens of high quality and beautifully preserved, but they may be fresh biological items needing preservation treatment or, perhaps worse, museum items which are of poor quality either through intrinsic faults or poor conservation work. There is no attempt to deceive when other than perfect material is presented, it is included explicitly to test a candidate's knowledge of imperfection either in materials or techniques. Probably the first thing a candidate will wish to know is what kind of material should he or she expect to find at the practical examination. Generally speaking it is worth remembering that the examination is not always in a museum of natural history and that many of the specimens will have been taken by the examiner, so it is not likely that there will be anything very large. This, of course, leaves a tremendous range still and there really isn't anything one might not expect to see. Taking the subjects in turn, it is unlikely that there will be live zoological material, hence specimens will have been suitable for preservation. They might be mounted for display purposes or could be study specimens, such as insects prepared for cabinet storage, or mounted in a life-like pose; there could be study skins of birds and mammals or, again, set-up specimens for

display purposes. There are often fluid-preserved specimens, especially invertebrates without chitinous or calcareous exo-skeletons.

There will usually be a spread of material to cover vertebrate and invertebrate specimens and microscopic material is not excluded, indeed some basic knowledge of histology and cytology is assumed and may be tested. Sometimes macroscopic specimens may be parts of whole animals, thus skeletal material frequently appears and candidates should not only be able to recognise individual bones, but have some competence in comparative osteology, especially as indicators of locomotory habit, dominant sensory apparatus and brain developments.

Plant material will frequently include fresh specimens and the use of a key for identification is often tested. A word of warning here. The examination at present takes place in January and is unlikely to be moved to a part of the year when flowering plants are in profusion and in bloom, hence there must be a limitation to plants with overwintering aerial structures which can be tracked down with a key, including of course aquatic plants. While clearly this limits the range of specimens likely to be available, it also means a more difficult exercise for candidates other than experienced botanists, who are extremely familiar with, and competent users of, botanical keys. I have seen reasonably experienced botanists come quite unstuck in using keys, partly of course because the available time does not allow for familiarisation with an unknown key. On balance, if a candidate has no great experience in the techniques of using keys, they would be advised to steer clear of these questions - but of course the botanical examiner has a right to put this kind of question to a candidate !

Otherwise, the botanical questions will often include reference to herbarium specimens, especially in connection with the techniques for preparing herbarium mounts. Fluid mounted specimens may be included and also microscopic preparations, either of the histological features of Cryptogams or whole mounts of some lower orders.

In the manner that biological material may be used in questions having an ecological slant, so geological material, in addition to forming a basis for testing powers of identification, may also require a knowledge of geographical distribution and relationship to terrestrial chronology.

Rocks, mineral-bearing rocks, pure minerals and fossils may be on the examination bench. Fossils may have been removed from their surrounding matrix or could be intact.

The examiner will obviously be pleased if a candidate recognises a geological specimen, but remember that few marks are awarded for getting the name right. Deductive reasoning which leads to an identification will earn more marks and prove to an examiner that even a correct identification was not a good guess or pure fluke. Commonly the geological examiner will be very interested in problems relating to specimens, especially involving storage and conservation.

For all material, be it zoological, botanical or geological, a knowledge of relevant techniques is required. In the case of rocks and minerals, the use of physical and chemical tests as an aid to identification is looked for, although actual testing, other than the use of simple qualities such as colour, hardness, relative density and taste, is not required. Methods of detaching a fossil from its matrix may be sought and the appropriateness of particular methods for specific fossils and matrices expected. The most common techniques associated with all three types of material, which are questioned, are those associated with preservation and conservation. Candidates should expect to be able to give step-by-step procedures for converting a fresh biological specimen into a museum specimen, using techniques such as dehydration, freeze-drying, fluid impregnation and conventional taxidermy. An ability to deal with the killing and fixation of living material is often tested.

Techniques for special preparations used in display may be requested, including such processes as maceration and cleaning for skeletal material and injection techniques to display systemic features

The conservation of stored material is an important area, which is seldom absent from a practical examination. This includes the proper choice of storage cabinets, particularly the material from which they are made, and the avoidance of acids found in certain timbers and many forms of paper products. The use of safe insecticides and fungicides is a difficult area at a time when we are finding new health hazards in many of the traditionally used chemicals; so an up-to-date knowledge of the medical implications of using certain biocides is required.

#### The Conduct of the Examination

Armed with an adequate background knowledge of museum natural science, what should the candidate expect to face up to in the examination room ?

The examiners' job is to make every endeavour to put a candidate at ease. Examination nerves are not exceptional, rather the reverse. The most

hardened and well-prepared examinee has some doubts - doubts that they really know enough, and doubts that the questions will be fair, doubts that the examiners may be setting 'catch' questions and certainly a doubt that they will have enough time to do justice to themselves.

With the best will in the world, examiners sometimes run late and candidates may be kept waiting beyond the time of appointment for their individual examination. Don't panic! Come prepared with something to read - something light and relaxing. When you enter the examination room the supervising examiner will check your number to ensure that you are the person they are expecting. The examiners will then be introduced to you in turn and usually you will be told their area of specialisation - you may of course know them, we are a small profession.

It is likely that you will be asked a few questions about your portfolio or thesis, although this is unlikely to occupy very much time. The examiners will have marked these previously, but may wish to clear up any points of misunderstanding or fill in any gaps. They would also welcome a knowledge of any special fields in which you claim to have an expertise.

You will of course see all the specimens on the table. Usually they will be arranged in separate subject sections and the appropriate examiner will sit behind his own material. The questions must be written, either on cards placed next to the relevant objects, or all the questions may be on one piece of paper and refer to numbered or lettered objects. There must be a minimum of fifteen objects, or groups of objects, that is five each for zoology, botany and geology.

You will be asked to choose any three questions, but instructed that you may not choose more than two from any single section, thus you may choose two zoological questions and one botanical, vice versa, or one from each subject area. They can be answered in any order. You will have between five and seven minutes to answer each question and this is not long. Answer the questions asked. A single question may require a series of separate answers or an answer relating a step-by-step analysis or technical procedure.

When you have completed the questions you have chosen, or if you have been slow, when the examiner tells you that time is up, you will be given one question to answer by each examiner from material in their own subject section. You could therefore finish up having answered three zoological and two botanical questions and one geological question or any other combination which adds up to six.

There can also be penalty marks deducted for candidates who have given a laboured and pedestrian performance and who have over-run their time allowance. Alternatively, there are often bonus marks for impressive performances.

Remember that you can handle the objects, but also remember that you may lose marks for incorrect handling and not having regard to the delicacy of museum specimens. If instruments are needed for handling specimens they will generally be provided, therefore if you see instruments on the bench, take it that they are necessary, at least for some questions. If hand magnifiers are needed they should be provided, but there is nothing to prevent you using one of your own. The same applies to reference works, especially identification keys. You will not require any writing or drawing instruments as the whole examination is an oral one, but a watch would be useful. Above all, try to adopt a confident attitude, face the examiners squarely, look at them, not down at your boots. Speak as clearly as you can. Do not rely upon an indistinct answer being given the benefit of the doubt. We usually reckon that we can assess pass or fail potential within a couple of minutes after a candidate has entered the examination room !

### The Questions

It is the job of the examiners to set questions which can be clearly understood and are devoid of ambiguity. A question may be a single one, for example:-

"Identify specimens A, B and C."

The answer must be direct, but should explain why you have arrived at your decision, based upon diagnostic features that you have recognised and which you associate with the characteristics of particular taxonomic groups. If you cannot pin-point a specimen accurately, indicate the sources of reference you would consult. Some questions may seek information additional to identification, for example you might be asked to indicate reference sources, including taxonomic works, museum collections and specialist colleagues for consultation.

Not every question will rely upon identification, although without knowing what the specimens are, you would be in some difficulty in providing the information sought. You could be asked about displaying specimens, including the context in which they could be used, the information you would

supply and the conservation measures you would observe. Similarly, there is usually some reference to storage, including the documentation belonging to stored specimens. Field collecting techniques are sometimes asked for, especially in dealing with living materials which must be given some treatment before removing them to the museum. The educational uses of natural science material may be included as part of a question, which could be phrased "A small boy brings specimen X to your museum. What would you tell him about it and how would you explain to him that he has contravened a nature conservation regulation?"

In asking questions on conservation and preservation techniques, you may find that the examiner has presented a perfectly prepared museum specimen and merely wishes to know how this has been achieved. Less simple are the occasions when specimens have deteriorated through imperfect original conservation and then you need to be able to explain what went wrong and often if the deterioration can be halted. Occasionally you may be given something which has undergone partial treatment and you need to be able to suggest how the process could be completed.

#### Final Advice

Basic knowledge is essential and while you cannot possibly waffle your way through, you can get a long way by using common sense. Try to be logical in assessing specimens, look at their characteristics and if in an examination you make a mental note of every feature it is very likely that some bells will begin to ring. The examiners will not answer the questions for you, but they will try to correct you when you are chasing a false hare and they will ask you leading supplementary questions to urge you along the right pathway.

It is worth reflecting that the candidate who needs no prodding and who races through six questions without a falter is a pretty rare bird - I don't think I recollect one in the last ten years. Yet the pass rate is not all that low !

and North West

The South-East/Area Councils arrange mock practicals, others may follow - try to get to one.

JIM BATEMAN

CHAIRMAN OF EXAMINERS

FORMER EXAMINER IN NATURAL SCIENCES