

Scottish Beekeepers' Association

Education and Examination Committee

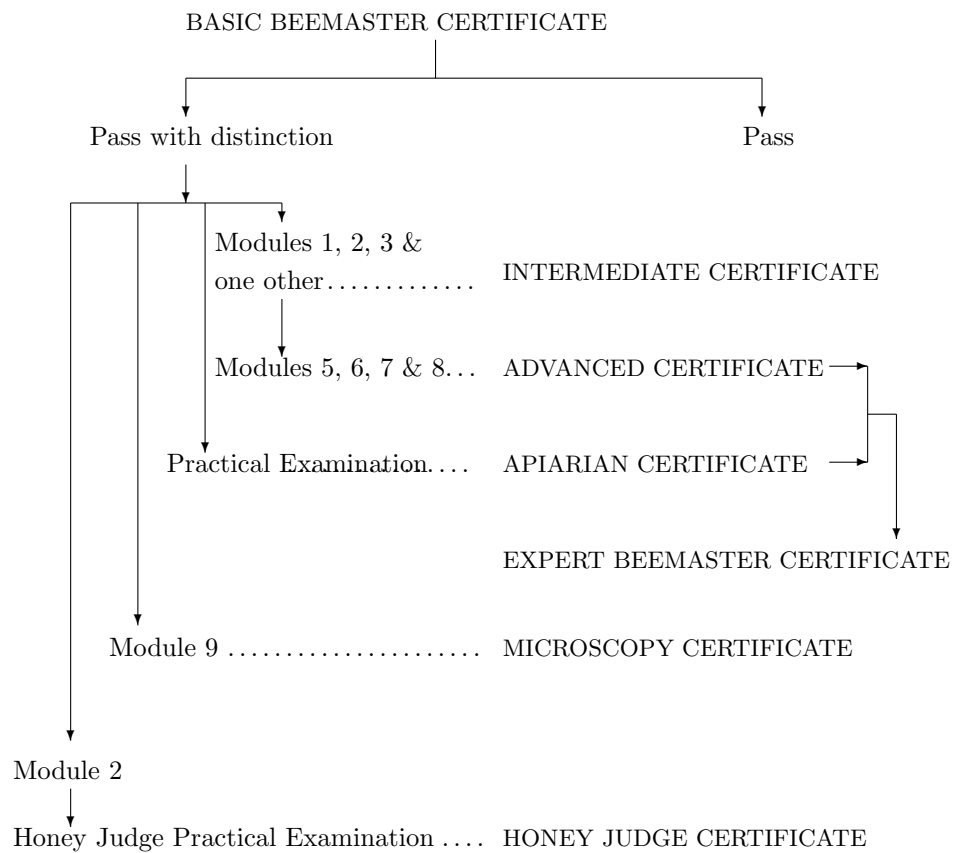


Syllabus

of Examination in Apiculture

Microscopy Certificate

THE SCOTTISH BEEKEEPERS' ASSOCIATION
EXAMINATION STRUCTURE



ACKNOWLEDGEMENT

The module in this prospectus has been written by members of the BBKA Examinations Board.

BBKA and SBA recognise that there is a need to harmonise their examination syllabuses and assessment standards.

With this in mind, BBKA has agreed that it is highly desirable that SBA should use the same modular content, while still preserving its autonomy in examination structure and issue of awards.

THE SCOTTISH BEEKEEPERS' ASSOCIATION

THE MICROSCOPY CERTIFICATE

PROSPECTUS

AIMS

- 1. To improve the standard and enjoyment of beekeeping in Scotland.
2. To give beekeepers who have obtained the SCOTTISH BASIC BEEMASTER'S CERTIFICATE, with distinction, and have an interest in honeybee anatomy, the detection of honeybee diseases and the identification of pollen and honey, the opportunity to obtain the SCOTTISH MICROSCOPY CERTIFICATE.
3. To obtain exemption from the microscopy section of the examination for the SCOTTISH APIARIAN CERTIFICATE.

CONDITIONS OF ENTRY

- 1. The candidate shall have gained the SCOTTISH BASIC BEEMASTER'S CERTIFICATE, with distinction, or an equivalent qualification approved by the Education Committee. The date when this certificate was obtained shall be entered on the application form.
2. The candidate shall have owned and managed bees for at least one year.
3. The appropriate application form and fees shall have been received by the Education Convener prior to the deadline published in The Scottish Beekeeper magazine.

AWARD OF CERTIFICATE

The SCOTTISH MICROSCOPY CERTIFICATE will be awarded to candidates who have performed satisfactorily in all seven sections of the examination syllabus.

THE EXAMINATION

- 1. The candidate shall provide:-
suitable microscopes (one dissecting and one compound);
dissecting containers, tools and instruments;
spare microscope slides and cover slips;
any stains, fixatives, mountants etc;
six pollen slides and three anatomy slides prepared by the candidate during the past year;
any other equipment the candidate may require.
2. Material prepared during and prior to the examination will be assessed.

THE SCOTTISH BEEKEEPERS' ASSOCIATION
Examinations for Proficiency in Beekeeping
APPLICATION FORM
Candidate's Name, Address, Postcode, Present number of stocks, Books studied, Which Bee Journals do you read?, Local Association, Examination(s) applied for, Signature, Date, Fee Enclosed, SBA Member YES/NO, Basic Certificate awarded by, Number.

Please send this form, with the necessary fee, to the Education Convener

6.0 POLLEN IDENTIFICATION

The Candidate shall discuss with the Examiner:

- 6.1 the general construction of a pollen grain;
- 6.2 the collection and preparation of pollen from (a) flowers, (b) pollen loads from the honey bee, (c) honey;
- 6.3 provide for discussion 6 slides, made by the Candidate, labelled with the date the slide was made, the scientific name and the approximate size, selected from the following list of pollen grains:
Forget-me-not, dandelion, rape, lime, sycamore, poached egg plant, crocus, willow, heather, hogweed, rosemary, hawthorn, hazel;
- 6.4 how the slides were made and how they should be stored for long term use; how the size of the pollen on the slides was determined.

7.0 DISSECTION AND ANATOMY OF THE HONEYBEE

- 7.1 The candidate shall provide a worker bee prepared and set in wax ready for dissection of its alimentary tract and demonstrate the step by step process in dissecting the alimentary tract.
- 7.2 The Candidate shall provide for discussion three slides made by the Candidate from the following list:
the three legs of a worker; the two wings of a worker (from either the right or left side); sperm; an egg; hypopharyngeal glands; the sting of a worker; the proboscis of a worker; antennae of a worker and a drone; portion of a trachea; *Braula coeca* and *Varroa destructor* on the same slide.

3. An Examiner approved by the Education Committee will conduct the examination. Normally only the Examiner and the Candidate will be present at the examination. Should the Education Committee wish a trainee examiner or a member of the committee to be present as an observer, prior approval of the candidate will be obtained.
4. The examination will be conducted at a place and time mutually convenient to Examiner and Candidate. It will be of an oral and practical nature.
5. The examination will normally take about $2\frac{1}{2}$ hours.

1.0 CONSTRUCTION AND PARTS OF A MICROSCOPE

The Candidate shall discuss with the Examiner:

- 1.1 the essential differences between microscopes used for dissection and those used for examining the detail on smears and specimens down to about $0.25\mu\text{m}$ in size;
- 1.2 the difference between reflected light and transmitted light for illuminating the object and how these are achieved in the construction of a microscope;
- 1.3 the concept of lens magnification for both a single lens and a compound system of lenses in simple terms only;
- 1.4 the purpose of the principal parts of the dissecting microscope;
- 1.5 the purpose of the principal parts of the compound microscope.

2.0 PRINCIPLES AND THEORY OF THE LIGHT MICROSCOPE

The Candidate shall discuss with the Examiner:

- 2.1 the range of magnification required for a dissecting microscope suitable for dissecting a honeybee and how this range is achieved;
- 2.2 the range of magnification of a compound microscope suitable for examining specimens for the detection of honeybee diseases except those caused by viruses;
- 2.3 the minimum sized object that can be seen using a light microscope (the theory of this is not required);
- 2.4 the function of the eyepiece, the objective and the condenser/mirror of the compound microscope;
- 2.5 the purpose of the stage, condenser, diaphragm, coarse and fine focus, eyepiece, objective lenses in the use of the compound microscope;
- 2.6 the concepts of refractive index, critical illumination, numerical aperture, chromatic and spherical aberration and resolution in simple terms;
- 2.7 what is meant by the term 'depth of field' and its importance;
- 2.8 the advantages of par focal lenses;
- 2.9 the use of oil immersion for higher magnifications and the refractive index of the oil used for this purpose;
- 2.10 the advantage of using filters of different colours;
- 2.11 the use of an eyepiece graticule and its calibration.

3.0 SETTING UP MICROSCOPES FOR BEE DISEASES AND POLLEN IDENTIFICATION

The Candidate shall demonstrate to the Examiner:

- 3.1 the setting up of a dissecting microscope for the identification of acarine;
- 3.2 the setting up of a compound microscope for the identification of nosema and amoeba;
- 3.3 the setting up of a compound microscope for oil immersion to view very small specimens eg pollen and bacteria.

The Candidate shall discuss with the Examiner:

- 3.4 the magnification required for acarine, nosema, amoeba, AFB, EFB, and pollen identification giving the approximate size of the pathogens and the approximate range of sizes of pollen grains commonly collected by the honeybee in the UK.

4.0 DIAGNOSIS OF THE ADULT BEE DISEASES

The Candidate shall discuss with the Examiner:

- 4.1 the size of the sample required for the examination of adult bee diseases and its statistical significance;
- 4.2 how and where the sample should be taken from the hive and the reasons involved;
- 4.3 the classification of nosema infection into light, medium and heavy with recommendations for treatment of the disease.

The Candidate shall demonstrate to the Examiner:

- 4.4 the examination of a sample for acarine and determination of the probable level of colony infection;
- 4.5 the examination of a sample for nosema and amoeba;
- 4.6 identification of *Varroa destructor* and *Braula coeca* from slides provided and discuss their main anatomical features and differences.

5.0 DIAGNOSIS OF AFB AND EFB

The Candidate shall discuss with the Examiner:

- 5.1 how to obtain a suitable sample for AFB from infected comb;
- 5.2 how to obtain a sample for EFB and the appearance of an infected larva;
- 5.3 how each sample would be processed and the smear prepared for examination under the microscope.

(It is to be noted that candidates will not be required to diagnose an actual sample due to the statutory requirements involved.)