# BBKA MICROSCOPY CERTIFICATE

## SYLLABUS

## Applicable from January 2020

### Aims

**This Assessment aims to provide a qualification and measure of achievement for those beekeepers with an interest in the microscopic observation and identification of pollen, anatomy and adult bee diseases relevant to the honey bee.**

A certificate holder should be able to give beekeepers practical guidance on the selection and use of microscopes, help them identify adult bee diseases from samples provided and give them advice on where to find further sources of information.

A pass in the Microscopy Certificate gives exemption to the Microscopy Section of the Advanced Husbandry Assessment.

### Entry Requirements

The Candidate shall have passed the BBKA Basic Assessment or an equivalent Assessment approved by the Board. The date on which the Certificate was obtained shall be entered on the Application Form.

### The Assessment.

(a) Assessors approved by the Board shall conduct the Assessment. The Board may wish a trainee Assessor or a member of the Board to be present as an observer, but prior approval of the Candidate must be obtained.

(b) The candidate shall provide:

- Two suitable microscopes, one for dissection and one for the examination of microscope slides (a compound microscope with x400 magnification) including an eyepiece fitted with a graticule)
- the equipment needed to calibrate an eyepiece graticule (e.g stage micrometer or a slide of Hazel pollen)
- Dissecting tools and instruments
- Spare slides and cover slips
- 6 pollen slides and 4 anatomy slides made by the candidate from the lists provided in the syllabus
- Approximately 40 freshly killed worker bees.
- **A few pollen loads.**
- **The equipment required to make a pollen slide from a pollen load.**
- The equipment required to embed one or more bees in wax for dissection purposes
- Any other equipment the candidate may require.

(c) A requirement of the Assessment is the examination of the material prepared by the Candidate.

**(d) No naked flames to be used in the Assessment.**

(e) The Assessment shall be conducted by two Assessors at a venue and time determined by the Board and shall be of an oral and practical nature.

(f) The Assessment may be expected to be completed within 2½ to 3 hours.

# SYLLABUS

## 1.0 CONSTRUCTION AND PARTS OF A MICROSCOPE

The Candidate shall discuss with the Assessor:

1.1 The essential differences between microscopes used for dissection and those used for examining the detail on smears and specimens down to about 0.25µm 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 high power microscope.

## 2.0 PRINCIPLES AND THEORY OF THE LIGHT MICROSCOPES

The Candidate shall discuss with the Assessor:

2.1 The range of magnification required for a dissecting microscope suitable for dissecting a honey bee and how this range is achieved

2.2 The range of magnification of a compound microscope suitable for examining specimens for the detection of honey bee diseases except those caused by viruses

2.3 The minimum sized object that can be seen using a light microscope and an elementary understanding of the dependence of this on the wavelength of light and the numerical aperture of the objective

2.4 The functions of the stage, condenser/mirror, diaphragm, eyepiece, objective lenses, coarse and fine focus, in the high power microscope

2.5 The optical features to be taken into consideration in the choice of a microscope. For example, good resolution, minimal distortion of image, a flat optical field, par focal and spring-loaded objectives

2.6 What is meant by the term 'depth of field' and its importance

2.7 The use of oil immersion for higher magnifications and the significance of the refractive index of the oil

2.8 The advantages of using filters of different colours

2.9 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 Assessor:

3.1 The setting up of a dissecting microscope for the identification of Acarine

3.2 The setting up of a high power microscope for the identification of Nosema and Amoeba

3.3 The setting up of a high power microscope and calibration of an eyepiece graticule to measure the diameter of pollen

The Candidate shall discuss with the Assessor:

3.4 The magnification required for the identification of Acarine, Nosema, Amoeba giving the

approximate size of these pathogens

3.5 The magnification required for the identification of pollen giving the approximate range of sizes of pollen grains commonly collected by the honey bee in the UK.

## 4.0 DIAGNOSIS OF ADULT BEE DISEASES AND COLONY INFESTATIONS

The Candidate shall demonstrate to the Assessor:

4.1 The dissection and examination of a worker bee for the presence of Acarine

4.2 The preparation and examination of a sample of bees for Nosema and Amoeba

The Candidate shall discuss with the Assessor:

4.3 The size of the sample required for the examination of adult bee diseases and its statistical significance

4.4 How and where the adult bee sample should be taken from the hive and the reasons involved

4.5 The assessment of the level of infection or infestation and likely outcomes if treatment is withheld.

4.6 What advice should be given to beekeepers on the actions to be taken and sources of information in the event of an adult bee disease or colony infestation being suspected or identified.

## 5.0 POLLEN IDENTIFICATION

**The candidate shall demonstrate to the Assessor:**

**5.1 The preparation and examination of a pollen load from a honey bee.**

The Candidate shall discuss with the Assessor:

5.2 The general construction of a pollen grain

5.3 The collection and preparation of pollen from (a) flowers, (b) pollen loads from the honey bee, (c) honey

5.4 Six 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, Spring crocus, willow, any heather, hogweed, rosemary, hawthorn, hazel

5.5 How the slides were made and how they should be stored for long term use

5.6 How the size of the pollen on the slides was determined

5.7 Three pollen slides provided by the assessor.

5.8 An outline of how microscopic analysis can be used to determine the floral sources and geographic origin of honey samples including the need to take into account the over and under representation of pollen in a multifloral honey.

5.9 How the presence of honeydew in a honey sample can be detected by microscopic examination.

## 6.0 DISSECTION AND ANATOMY OF THE HONEY BEE

6.1 The Candidate shall provide freshly killed workers, demonstrate ability to embed them in wax during the Assessment and be able to perform and discuss the abdominal dissection as requested by the Assessor.

6.2 The Candidate shall make and provide for discussion four labelled anatomical slides with one slide made from each of the following four lists. At least three of these slides should be prepared as permanent hard mounts.

| List A | List B | List C | List D |
|---|---|---|---|
| Front, middle and hind leg of worker<br>(all same side) | Mouthparts of worker<br>(displayed) | Fore and hind wings of worker or drone<br>**(all same side with wing roots)** | Sperm |
| Comparative slide of a hind leg from drone queen & worker<br>(all same side) | Comparative slide of mandibles of drone, queen and worker<br>(all same side) | Antennae of both worker and drone<br>(in pairs) | Two Varroa<br>(one mounted dorsally and the other ventrally side by side) |
| Everted endophallus of drone | Sting mechanism of worker or queen | **First thoracic trachea** | **A stained portion of the Hypopharyngeal gland – to see the acini** |

## 7.0 HEALTH AND SAFETY

The Candidate shall discuss with the Assessor

7.1 The potential hazards of working with chemicals, naked flames, microscopes, electrical devices & dissecting instruments

7.2 The need to undertake a risk assessment before commencing any activity of a practical nature

7.3 The need to wear protective clothing, chemical resistant gloves and goggles when handling hazardous chemicals and to always work safely with respect to themselves and others.

7.4 The safe disposal of hazardous waste e.g. chemicals, broken glass slides, scalpel blades and remains of bees/biowaste.

**7.5 The importance of Material Safety Data Sheets (MSDS).**

## APPLICATION TO ENTER

### Application to Enter.

These should be made through the Local Examination Secretary of the County Beekeeping Association or directly to the BBKA Examinations Board Secretary at the Address given below. Applications are required not later than 31st August in the year the Assessment is to be taken.

### Application Form.

Any application must be accompanied by a completed Application Form together with the Examination Fee. Cheques should be made payable to BBKA. The dates when any relevant certificates were obtained must be entered on the Application Form. Certificates should not be sent.

### Assessment Fee.

Details of the current fee for the Assessment may be obtained from the Local Examination Secretary or the Board Secretary.

## AUTHORITY

The above is issued by the BBKA Examinations Board and all communications in respect of the Examinations should be addressed to:

The Secretary,
BBKA Examinations Board,
The British Beekeepers' Association,
Stoneleigh Park,
Kenilworth,
Warwickshire.
CV8 2LG

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