BRITISH BEEKEEPERS' ASSOCIATION

MODULE 3 HONEYBEE DISEASES, PESTS AND POISONING

This is an example of questions used in past papers. It is also an example of how the question paper is laid out. There is a mark scheme to all modules, but examiners are instructed to accept any correct answers to a question even if it is not mentioned in the mark scheme.

Do remember to read the question carefully and only answer what is asked, not what you wished was asked or immediately came to mind. Additional information will take time to write down and will not score any marks.

Do write the answers to Section A on the question paper and hand it in at the end of the examination.

In Section B the instruction is to use short phrases. This can be interpreted as 'bullet points', so full sentences are not required. Just get the facts down.

However in Section C, longer explanations may be required.

This examination is Module 3, but a basic knowledge of anatomy of bees is required. This knowledge makes more sense when discussing diseases affecting specific organs. The information required for this module can be looked up and studied from the relevant literature as well as having practical experience. Remember there is no need to do the modules in number sequence, except Module 8 which is required to be the last taken.

SECTION A 1 mark for each question, (the numbers next to the question or answer are the syllabus number)

Q1 Give the scientific name of the Asian hornet.
3.6 Vespa velutina (nigrithorax)

Q2 Name one **field crop** which may be sprayed with a chemical harmful to bees
3.22 either Oilseed rape, or field beans

Q3 Which organ may be infected with amoeba?
3.13 Malpighian tubules
The Honey Bee around and about - Davis

Q4 Give one difference in the appearance of varroa and braula.
3.20 Shape, number and position of legs
NBU advisory leaflet - Managing varroa

Q5 Name a pest which may attack hives over winter.
3.26 Mice, Green woodpecker
The Honey Bee around and about - Davis

Q6 What disease is associated with Nosema in queen rearing enterprises?
3.18 Black queen cell Virus

Q7 Give the scientific name of the greater wax moth
3.27 Galleria mellonella

Q8 Name a notifiable honey bee disease
3.7 AFB or EFB
NBU Advisory leaflet - Statutory Procedures Advisory Leaflet (do not accept pests)

Q9 What size hole or slot would keep mice out of hive in winter?
3.26 9mm diameter hole or 7mm high slot

Q10 What type of organism causes chalk brood
3.14 Fungus
NBU Advisory leaflet - Foulbrood diseases of Honey Bees

Section B

Q11	(a)	Give the cause, of sac brood.	1
	(b)	List the signs of the disease	5
	(c)	Briefly describe the progression of this disease.	6
	(d)	How would the beekeeper deal with this disease?	3

3.14
(a) A virus

(b) Pepperpot brood pattern
odd cells in the process of being uncapped
flattened unusual cappings
Fluid bag in cell shaped like a Chinese slipper
A dried gondola shaped (nose up) removable scale

(c) Virus fed to larvae in larval food
Kills larvae after the cell is sealed at the prepupal stage
The virus prevents the completion of the fifth moult.
The outer cuticle is not shed and the space inside fills with ecdysial fluid
The prepupa dies in the fluid filled bag - hence the term sac brood
The dead prepupa lies on its back with head towards the top of the cell
The prepupa turns pale yellow in colour and then dark brown
The head turns up as the body dries to a thin dark brown scale lying along the bottom wall of the cell
Scale can be removed in one piece

(d) No specific treatment
Requeen
Full comb change

NBU Advisory leaflet - Foulbrood disease of honey bees
The Honey Bee around and about - Davis

Q12 (a) Explain how to fumigate comb using ethanoic (acetic) acid. 10
(b) What safety precautions should be taken. 5

3.16(a) use 80% acetic acid
Scrape all woodwork free of propolis and wax and burn
Coat metal parts with Vaseline or remove
Place clean solid hive floor on ground - entrance sealed
Build stack of boxes with pad containing 140ml acetic acid between each box or on top
Ekes may be required
Close stack with crown board and roof
Seal stack with tape or polythene wrap
Open stack after one week (longer in cold weather)
Air boxes for two days before use

(b) Carry out procedure away from people and animals
use protective clothing, gloves and goggles
Avoid acid contact with concrete and metal
Have water available to dilute spills
Store acid in original containers in secure place away from pets and children
NBU Fact sheet - Fumigating combs

Q13 (a) How would a beekeeper recognise the different stages of small hive beetle in a hive? 10

(b) What action should be taken if the beekeeper suspects the presence of small hive beetle ? 5

(a) 3.6 Adults, 5-7mm, Black
Clubbed antennae
Hides from light, found in crevices
Short wing cases

Larvae -10-11 mm, Beige
2 rows of spines on dorsal surface
3 pairs of legs at head end
No pro legs on abdomen
Allowed: tunnel and eat wax, honey

Eggs - 1.5-0.25 mm, White
Massed in hive crevices or floor

Comb - Destroyed or damaged
distinctive (rotten orange) smell of fermenting honey

b) 3.7 Stop the inspection
Reduce the entrance
Contact bee inspector or NBU as this is a notifiable pest SASA in Scotland
Don't open other colonies in the apiary
Don't remove anything from the apiary (voluntary standstill)
dead sample, photo
NBU Advisory leaflet - The small hive beetle

Q14	(a)	Name the two species of Nosema.	2
	(b)	What constitutes a suitable sample of bees to test for the presence of Nosema and why?	4
	(c)	List the steps of the laboratory method used to confirm the presence of Nosema in a sample of bees.	9

(a) 3.15 *N. apis, N. ceranae*

(b) Sample 30 bees,
Gives 95% chance of finding 10% infection
Older bees are required for sample, allowing time for infection to develop

(c) 3.15 Kill bees - freeze, killing fluid, ethyl acetate
Remove abdomen
Grind in pestle and mortar with a few drops of water
Place drop on slide with glass rod
Apply cover slip
View with microscope at x400
Nosema spores are rice grain shaped
5-8 microns long x 2-3 microns wide
Nigrosin stain may be used
Individual ventriculus may be examined.

NBU Advisory leaflet - Common pests, diseases and disorders of the adult honey bee
Practical microscopy for beekeepers - Maurer

Q15 (a) Give the reasons for carrying out a Bailey Comb Change 3
(b) Describe how to carry out a Bailey Comb Change in a normal colony 12

(a) 3.17 Reduce pathogen load – Nosema, sacbrood
Replace old or damaged combs

(b) Clean brood chamber with a full complement of frames with foundation.
Place new brood chamber over existing one
Feed syrup
Allow bees to draw out some of the foundation
Find queen and put her onto drawn foundation or move her on existing frame into top box
Put queen excluder between boxes with the queen in the upper box
Place new hive entrance between boxes, **above queen excluder**, facing the same direction as existing entrance
Close old entrance to reduce pollen stored in bottom box
After three weeks brood in bottom box will have hatched
Remove old brood chamber
If queen moved into top box on old comb, replace with new foundation
Continue to feed if necessary
Replace, floor, crown board and roof with clean equipment
NBU Fact sheet - Replacing old brood comb

Section C

Q16	(a)	Give the scientific names for the causative organisms of American Foul Brood and European Foul Brood	2
	(b)	Detail the signs of EFB	8
	(c)	Detail the signs of AFB	7
	(d)	How can the beekeeper help to prevent the spread of these diseases?	13

(a) 3.2 AFB *Paenibacillus larvae*, EFB *Melissococcus plutonius*

b) 3.1 Larva usually dies before cell sealed.
Larva has a melted down appearance, losing segmentation.
Larva lies unnaturally in the cell, not in usual c shape in the bottom of cell.
Gut creamy white with bacteria load.
Dries to form rubbery loose brown scale anywhere in the cell, which can be removed.
Patchy brood pattern, as bees can remove the dead/dying.
May be an odour depending on presence of secondary bacteria.
If surviving to the sealed stage the cappings are sunken/greasy.
No roping of cell contents, or occasionally a short granular rope.

c) 3.1 Larva dies after cell sealed.
Cappings sunken, perforated, moist/greasy.
Cell contents will rope with a long smooth rope
Dries to dark brown non-removable scale.
Scale always found in bottom V of the cell,
Occasionally the proboscis protrudes.
Patchy brood pattern as queen cannot lay in cell containing a scale.

d) 3.4 Regular brood disease inspections.
Don't transfer brood combs between colonies unless disease free.
Don't bring contaminated equipment into apiary
Never use second hand comb unless accompanied by bees
Control robbing and drifting.
Implement regular comb replacement.
Don't move supers between colonies unless disease free.
Seal hive if colony dies out (dead outs).
Don’t spill honey, syrup or wax
Don't feed honey unless own.
Isolation apiary for swarms and purchased colonies.
Clean or wash gloves and hive tool in washing soda between hives
Clean/wash bee suit regularly (daily or different suit between apiaries).
NBU Advisory leaflet Foulbrood Diseases of Honey Bees.

Q17 (a) Describe the lifecycle of varroa destructor. 10
(b) Explain how to monitor varroa levels in a colony using the natural mite drop and the drone uncapping methods . Give the pros and cons of each method. 20

Q17 a). 3.9 Adult gravid female enters brood cell prior to capping.
Stays in brood food until cell capped **with snorkel (peritreme)**
Prefers drone brood but will also use worker brood.
Establishes a feeding site on the larvae
60-70 hours after capping lays first egg.
1 male followed by 4-5 female eggs laid at 30 hour intervals.
Male egg hatches first then females.
Develops through protonymph and deutonymph stages before becoming adult.
Development time from egg to adult 5-6 days males, 6-7 days females.
Male mates with females in cells then dies.
Mature females emerge from cell when bee emerges.
Reproductive cycle linked to bee development time - more mites produced in drone brood than worker brood.
Up to 3 cycles per female

b) 3.10 Natural mite drop:
Colony on OMF with sample tray
Examine floor debris, count mites (Mix debris with meths if necessary)
Convert to daily mite drop.
Mite drop is related to colony varroa load.
Look up on NBU calculator.
Pros: Colony undisturbed, simple and cheap, not very accurate
Cons: Extra equipment, uncleaned floors encourage wax moths.
Monitor over period of time.

Drone brood uncapping:
Select brood at advanced stage - pink eye.
Slide prongs of uncapping fork under cappings of at least 100 pupae.
Lift out drone pupae, Varroa easily seen on pupae.
Estimate proportion of infested pupae.
More than 5-10% infestation levels are serious.(5-10 drone pupae with mites)
Pros: Quick, easy and cheap, instant indication of infestation levels.
Cons: Unlikely to detect light infestations, results are approximate.
Depletes drones which are necessary for mating
NBU Advisory leaflet - Monitoring varroa