

BRITISH BEEKEEPERS' ASSOCIATION
MODULE 8 BEEKEEPING AND HONEY BEE MANAGEMENT
Sample Paper Marking Scheme

- Marks should only be awarded for points which answer the question.
- The allocation of points to be included are a guide to what should be included and are not necessarily definitive.
- Where more points are provided than the number requested eg 8 points when only 6 are asked for, then first 6 answers should be taken.
- 0 marks if answer doesn't work
- Do not penalise poor spelling so long as the meaning is clear other than technical terms.
- **How the answer is phrased is not important but that aspect must be understood from the answer rather than just mentioning the words.**

SECTION A (10 marks, 1 for each question)

Q1 Which hive is associated with Simmins?

A Commercial hive.

Q2 Name a US beekeeper who in 1875 is credited with designing the fist handheld smoker incorporating bellows.

A Moses Quinby or TF Bingham

Q3 Nosema is classified as what type of organism?

A Microspodian

Q4 What is the specific gravity of honey with 18% water content at 20°C?

A 1.4

Q5 What is the minimum height of the type front for the weight of a 454g (1lb) on the label of a jar of honey?

A 4mm

Q6 What is the recommended number of colonies per hectare in an apple orchard?

A 2 per hectare (1per acre)

Q7 Why does oil seed rape honey granulate so rapidly?

A High glucose to water ratio

Q8 What name is given to the technique to determine the floral source of honey?

A Melissopalynology?

Q9 The pollen grain of which species can be used as a reference when measuring pollen grain sizes?

A Hazel

Q10 Which instrument is commonly used to measure the water content of honey?

A Refractometer

Section B

- Q11 (a) Other than amoebiosis, name three **non viral** diseases which can affect adult honeybees in the UK. 3
- (b) How do two of the diseases named above impact on colony health and it's seasonal management. 12

Q11 (a) Other than amoebiosis name three non viral diseases which can affect adult honeybees in the UK. 3 Marks

Any 3 of the following:

Acarine, *Nosema apis*, *Nosema ceranae*, Varroa

(b) How do two of the diseases named above impact on colony health and its seasonal management. 12 Marks

Acariosis:

1. Infected adults have shorter life span
2. Bees susceptible to secondary infections
3. Often associated with crawling bees, 'k' wing, which is most likely CPV,
4. If heavily infected, best to destroy colony.
5. Thymol based varroa treatments will help to control

Nosema caused by *N. apis*

1. Colony failing to thrive, especially in spring due to premature aging and death of individuals,
2. Possible dysentery
3. Workers unable to digest protein from pollen,
4. Poor brood food gland development reduces nurse bees in colony
5. will clear up naturally during summer months if bees able to fly freely.
6. Change combs to remove residual infection.
7. Strong colony may be able to use shook swarm, otherwise Bailey Frame change.

Nosema caused by *N. ceranae*.

1. Colony fails to thrive and may continue to dwindle into summer
2. Due to poor pollen digestion
3. Can lead to colony death
4. Change combs to remove residual infection.
5. Strong colony may be able to use shook swarm, otherwise Bailey Frame change.

Varroosis:

1. Mites on bees/in brood cells (especially drone),
2. Mites on mesh floor sample tray
3. Possibly evidence of deformed wing virus (DWV)
4. Shortens life of bees, especially if virus present
5. Damages brood
6. Monitor mite levels.
7. Use IPM to control mite numbers (<1000/colony)

1 mark per line to a maximum of 12 or if all points given

- Q12 The local association has been asked to provide an observation hive for a 3 day agricultural show where the observation hive will be located under cover in the beekeeper's marquee.
- (a) List the points to be considered when making up an observation hive with provision for 2 frames of brood and 1 super. 12
- (b) Give three factors to ensure public safety at the show. 3
- Note that for a 3 day show the observation hive needs to be free flying to reduce stress on the bees.

(a) List the points to be considered when making up an observation hive with provision for 2 frames of brood and 1 super. 12 Marks

Equipment:

1. Clean safety glass or Perspex
2. Insulated shutters to reduce heat loss at night
3. Provision for feeding eg honey jar with syrup on top, bees suck through top ventilation hole
4. Hive entrance away from public access
5. Ventilation

Stocking:

6. select for docile bees
7. Use evenly drawn comb not touching glass
8. Clean preferably new combs with worker and drone brood cells
9. At least one comb of brood of all stages, eggs, larvae of different ages and sealed brood
10. Old marked queen, will be less likely to object
11. Drones if possible, but probably not return
12. Enough worker bees to cover and keep warm, but allow sight of combs
13. Colony should be free from disease – notifiable, minimal varroa, chalk and sac brood
14. Adequate pollen and honey stores, or contact feeder

1 mark per line to a max of 12

b) Give three factors to ensure public safety at the show. 3 Marks

1. Rigid stable stand so that it would be impossible to pull it over
2. Entrance tube located above head height and away from public space
3. secured hive to stand
4. Suitable observation hive with double ventilation screens top and bottom, stop public being stung through screens
5. Steward on duty at all time public on site (and security at night)
6. First aider available in marquee
7. Show organisers fully aware that live bees on show
8. have adequate insurance

Any of the following 1 mark per line to a max of 3

Q13	(a)	What are exocrine glands?	2
	(b)	Describe briefly how the functions of the hypopharyngeal glands change during the life of a worker bee.	6
	(c)	Describe briefly how the functions of the mandibular glands change during the life of a worker bee	6
	(d)	Name one constituent of beeswax?	1

(a) What are exocrine glands? 2 Marks

1. glands with ducts that secrete to the exterior
2. many secrete pheromones

1 mark for each line

(b) Describe briefly how the functions of the hypopharyngeal glands change during the life of a worker bee. 6 Marks

1. Activated in the first few days of the young bee (about 3 days), plump when bee feeds on pollen
2. Maximum size in nurse bees – 6 to about 16 days
3. Produces brood food to feed larvae and queen – clear component
4. Gradually shrinks when bee becomes forager
5. Then secretes sucrase (to convert sucrose in nectar)
6. Also glucose oxidase and diastase
7. Winter bees activate glands again when brood is present by eating pollen
8. Reactivated if the colony loses the queen

1 mark for each line to a max of 6

(c) Describe briefly how the functions of the mandibular glands change during the life of a worker bee. 6 Marks

1. Also active in the first few days as a young bee feeding on pollen
2. Produces the fatty acids in brood food and royal jelly acts as preservative
3. Pantothenic acid, bioppterin plays part in caste determination
4. In older bee plus 12 days old secretion changes to 2 heptanone
5. This is minor alarm pheromone
6. Also acts as an anaesthetic i.e. used on wax moth

1 mark for each line to a max of 6

(d) Name one of the main constituents of wax? 1 Mark

1. esters of monohydric alcohols
2. fatty acids
3. hydroxyacids
4. paraffins, up to 10% other substances

Any of the above max of 1

- Q14 (a) What are the factors affecting the crystallisation of honey, include – speed of crystallisation, size of crystals, type of honey. 8
- (b) Diastase and HMF are mentioned in the current Honey Regulations. What are they and what is the significance and importance of their presence in different types of honey? 7

(a) What are the factors affecting the crystallisation of honey, include – speed of crystallisation, size of crystals, type of honey. 8 Marks

1. honey is a supersaturated sugar solution
2. over time excess sugar will come out of solution and form crystal
3. this raises the water content of the remaining liquid honey and leads to separation with crystallised honey in a layer on top of liquid honey in a jar
4. need particles (nuclei) on which to form crystals [pollen, existing crystals],
5. process dependent on the glucose/water ratio
6. temperature – optimum granulation 57°F (14°C)
7. viscosity – high viscosity slows granulation
8. high glucose /fructose content crystallizes rapidly [rape]
9. high fructose/glucose slow [Robinia, blackberry, some mixed blossom honeys, lime, borage].
10. The more rapid the set the finer the crystals conversely slow set gives coarse crystals.

1 mark per line to a max of 8

(b) Diastase and HMF are mentioned in the current Honey Regulations. What are they and what is the significance and importance of their presence in different types of honey? 7 Marks

1. They are both indicators of quality of honey

Diastase

2. is an enzyme which hydrolyses starches
3. Produced by hypopharyngeal glands of foragers and in nectar by plants
4. Is damaged by heat so will be reduced if honey is overheated
5. Activity should be at least 8 measured with **Schade scale**,
6. there are exceptions - citrus
7. Activity level in Baker's honey is allowed to be lower

HMF is hydroxyl methyl furfuraldehyde or furfural

8. It is a breakdown product of fructose in the presence of acid
9. Heating of honey and storage will increase HMF levels
10. HMF level not to exceed 40 **mg/kg** (except Baker's honey)

1 mark per line to include the bold to a max of 7

- Q15 (a) List 4 desirable qualities of a queen's offspring for colonies kept in a suburban apiary? 4
- (b) How should a queen's qualities be assessed? 3
- (c) How should a good queen be managed to prolong her life for future queen rearing? 8

(a) What are the main qualities of a queen's offspring for colonies kept in a suburban apiary? 4

Marks

1. Good temper with neighbours in mind
2. Steady on comb so manipulation is easier (hive opened for shorter time)
3. Not followers
4. Not swarmy

1 mark per line to a max of 4

(b) How should a queen's qualities be assessed? 3 Marks

1. a check list and scored points
2. Assess her in the second year
3. assessing sister/daughter queens as well
4. Produce workers of the desired quality

1 mark per line to a max of 3

(c) How should a good queen be managed to prolong her life for future queen rearing? 8 Marks

1. In the second year retire her to a nuc using her own brood frames
2. Remove frames of sealed brood from time to time if nuc get too strong
3. Clip the queens wing if not already done
4. Replace with clean drawn comb or if strong foundation
5. Ensure strong enough at the end of the season to winter
6. Add extra sealed brood if necessary
7. Treat for varroa early to ensure a good population of bees for winter
8. Feed well and use fondant as insurance over winter
9. Nucs winter better in polystyrene

1 mark per line to a max of 8

Section C

- Q16 (a) Over the last two centuries, since the adoption of movable frame hives, there have been many theories about the cause of swarming. Briefly describe the major historical and modern aspects of these theories. 11
- (b) Give the actions the beekeeper can take to reduce or delay the urge to swarm. 6
- (c) (i) Describe in detail the vertical split method of swarm control once queen cells have been found in the brood nest. 10
- (ii) Outline the Taranov board method of swarm control 3

Q16 (a) Over the last two centuries, since the adoption of movable frame hives, there have been many theories about the cause of swarming. Briefly describe the major historical and modern aspects of these theories. 11 Marks

Historical:

1. **Excess of nurse bee** and larval food
2. This led to the production of queen cells to use up excess brood food.
3. **Congestion of brood nest** – Huber (late 18C)
4. Snelgrove lists in his 1943 book – crowding of brood nest & lack of space for queen to lay.
5. Huber also said **lack of contact with queen**.
6. diminution of queen's odour (1932) and restriction of egg laying space.

Modern aspects –

7. Most of above points play a part.
8. Swarming a natural reproductive instinct
9. **Queen substance recognised by Butler in 1950s**, later referred to as pheromones.
10. Major pheromones, queen from queen's mandibular glands – 9ODA and 9HDA.
11. Pheromones from queen's **tarsal glands** also important – spread when she walks over combs leading to queen cup formation where the queen rarely walks, the periphery of combs.
12. Old queen may lack sufficient pheromones can lead to swarming.
13. **Overcrowding** leads to lack of pheromones spread around.
14. **Recent evidence that bees try to replace queens only mated with few drones** can lead to swarming.

1 point per line to a maximum of 11 marks

(b) Give the actions the beekeeper can take to reduce or delay the urge to swarm. 6 Marks

1. Requeen regularly with queens less than 2 full seasons old
2. Provide super space when the brood nest has 6-7 frames occupied by brood
3. Increase space in brood chamber for queen to lay by adding another brood chamber or super (brood and half).
4. Remove sealed brood to another colony/nuc
5. Add additional supers when previous $\frac{3}{4}$ full for honey storage and processing
6. Give second super as foundation to occupy wax making bees
7. Use/rear non swarmy bees
8. Demaree split prior to formation of queen cells

1 point per line to a maximum of 6 marks

(c) (i) Describe in detail the vertical split method of swarm control once queen cells have been found in the brood nest. 10 Marks

1. Need an additional brood chamber with preferably drawn comb
2. Move the current brood chamber to one side
3. Find the queen and place her in the new brood chamber on the old floor
4. Replace the queen excluder and supers
5. Add an eke with rear entrance closed above the queen excluder –*or alternative*
6. Place the old brood chamber on top and go through the frames marking the frame with a ready to be sealed queen cell – remove all other cells
7. replace crown board and roof
8. The following week check for additional (emergency queen) cells and remove leaving the previously selected one to emerge as the future queen
9. Open the rear entrance
10. Older bees used to the normal front entrance will find the lower entrance and boost the honey gathering force of the old queen
11. The new queen will mate from the top entrance.
12. Once mated and laying, around four weeks later the old queen can be killed and the colony united.

1 mark per line to a maximum of 10 marks allow variations

(c) (ii) Outline the Taranov board method of swarm control. 3 Marks

1. sloping Taranov board placed 100mm from entrance
2. Shake all bees out in front of the hive onto a board
3. Having selected a suitable queen cell, do not shake this frame but brush bees off
4. Swarm with queen will collect under the board
5. Flying bees will enter hive

1 mark per line to a maximum of 3 marks

- Q17 Ling heather blossoms at the end of the season. The management of colonies to produce a good honey harvest needs special management. Give a detailed account of the following aspects:
- | | | |
|-----|---|----|
| (a) | preparation of colonies prior to the move to the moors; | 10 |
| (b) | setting up the heather apiary; | 2 |
| (c) | how and when the colonies can be transported to and from the crop assuming the site is 60 miles from the home apiary? | 7 |
| (d) | dealing with the colonies on their return to the home apiary to ensure successful wintering; | 3 |
| (e) | (i) what are the problems associated with removing ling heather honey from the comb? | 4 |
| | (ii) give a brief description of how ling heather honey is removed from the comb for bottling. | 4 |

(a) preparation of colonies prior to the move to the moors; 10 Marks

1. Ling blooms in late July and August and is one of the latest crops of the year.
 2. Colonies need to be at full strength at a time when numbers would naturally be declining.
 3. unite two disease free colonies,
 4. or the new queen from an artificial swarm to parent colony
 5. or bleed off bees from double stand to remaining colony on stand
 6. current year queen as she will continue to lay later in the season.
 7. Just before the move, rearrange brood nest with unsealed brood on outside of nest and sealed in centre
 8. This ensures queen will relay the centre combs that emerge earlier thus honey is stored in super
 9. Add supers with starter strips, foundation or previously drawn comb
 10. Colony should have stores, as moorland conditions can be harsh.
 11. Consider timing of varroa treatments before or after the move.
- 1 mark per line to a maximum of 10*

(b) setting up the heather apiary; 2 Marks

1. Ensure land owners permission
 2. Protection from farm animals
 3. Set out low stands
- 1 mark per line to a maximum of 2*

(c) How and when the colonies can be transported to and from the crop assuming the site is 60 miles from the home apiary. 7 Marks

1. Move when the crop has started to flower approx 12th august though this may vary year on year.
2. Add ventilation screen prior to the move and strap boxes straps in parallel or staples etc.
3. Move late in the evening or night/early morning
4. Close colonies with foam or light tight closure
5. Load so combs face direction of travel
6. Drive carefully without jarring
7. Spray with water if getting overheated
8. Unload onto prepared low stands
9. Remove foam and replace roofs
10. Ventilation screens can be replaced with crown boards later

1 mark per line to a maximum of 7

(d) dealing with the colonies on their return to the home apiary to ensure successful wintering.

3 Marks

1. Monitor Varroa and if necessary
2. treatment after removal of supers – MAQs strips and plan oxalic acid in Nov/Dec
3. Feed to bring stored honey to 30kg plus

1 mark per line to a maximum of 3

(e) (i) What are the problems associated with removing ling heather honey from the comb?

4 Marks

1. Ling heather honey is thixotropic (gel like) in nature
2. It has a naturally high water content giving a danger of fermentation.
3. Water content often around 19/20%
4. Danger of warming is that thixotropic nature heat does not penetrate so danger of overheating 36C (hive temp)

1 mark per line to a maximum of 4

(ii) Give a brief description of how ling heather honey is removed from the comb for bottling.

4 Marks

1. Honey may be pressed out after cutting comb from frame and wrapping in cloth
2. Or using a loosener followed by extraction in tangential extractor- saves the frames
3. Or Scrape frames to midrib then extract using a heather press – larger bubbles
4. Or place into a commercial spinner – smaller bubbles

1 mark per line to a maximum of 4