

**BRITISH BEEKEEPERS' ASSOCIATION  
MODULE 2 HONEYBEE PRODUCTS AND FORAGE  
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 Name one naturally occurring enzyme in honey.

A Diastase (amylase), sucrase, (invertase) glucose oxidase and catalase

Q2 According to the Honey (England) Regulations 2015 what is the permissible moisture content of honey from heather (Calluna)?

A Not more than 23%

Q3 What is melomel?

A Mead made by adding fruit or fruit juices

Q4 Give an example of a plant that produces unpalatable honey

A Ragwort, privet

Q5 What is the legal limit of hydroxymethylfurfural in wild flower honey in the UK?

A Not more than 40mg/kg

Q6 What is the optimum temperature to promote granulation of honey?

A 14°C or 57°F

Q7 What is the specific gravity of a honey with a moisture content of 20% at 20°C?

A 1.40 (accept 1.39 – 1.43)

Q8 What is the melting point of beeswax?

A Approx 145°F/62°C – 149°F/64°C

Q9 Name a plant that can indicate to pollinators that it has already been pollinated thus preventing unnecessary visits.

A Horse chestnut, forget-me-not, white clover

Q10 What are the two main sugars in honey?

A Fructose and glucose

## Section B

- Q11 (a) List three different methods of uncapping combs of honey. Give a brief account of each method. 9
- (b) List the precautions and actions required to ensure good hygiene practice and to prevent spoilage of the honey during the uncapping process. 6

**(a) List three different methods of uncapping combs of honey. Give a brief account of each method. 9 Marks**

Hand held knife – hot and cold *allow as 2 separate methods*

1. Prop the frame securely over the uncapping tray
2. Run the knife just under the cappings of the frame in a steady motion.
3. Knife can be hot or cold – electrically heated or immersed in hot water (wipe dry)

Cappings scratcher/uncapping fork

4. Use an uncapping fork and scratch off all the cappings
5. Hold over uncapping tray during process
6. Usually used in conjunction with knife to uncap low points in the comb

Uncapping rollers

7. Rollers covered in sharp spikes
8. Roll over the comb and
9. cappings are pierced but not removed

Mechanical uncapper

10. Oscillating blades skim off the cappings when the frames are fed into them
11. Variety of different types available depending on size of operation
12. Quick and efficient

Hot gun

13. Heat gun similar to a paint stripper
14. is quickly moved across the surface of the comb to melt the cappings

*3 marks per method – max 9 marks*

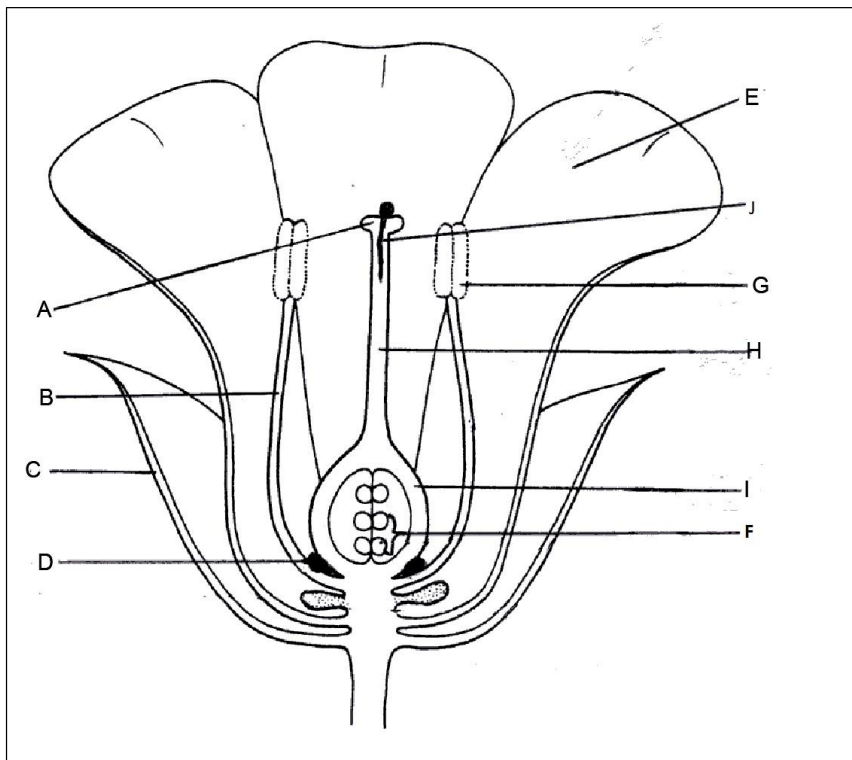
**(b) List the precautions and actions required to ensure good hygiene practice and to prevent spoilage of the honey during the uncapping process. 6 Marks**

1. Clean equipment and honey processing area (i.e. clean work surfaces and uncapping tray, no pets)
2. Suitable cleanliness of operator (i.e. tie hair back, wash hands etc)
3. Food grade equipment – food grade plastic, stainless steel
4. If using heated devices take care not to overheat the honey
5. Avoid introducing water – dry uncapping knife
6. Don't leave honey exposed to air for unnecessary length of time – hygroscopic
7. Safety of operator to avoid cuts

*1 mark per line to max 6 marks*

Q12 (a) List the parts of the flower A - J on the diagram provided.

5



- (b) What is happening at J on the diagram? 2
- (c) Briefly describe the difference between pollination and fertilisation. 2
- (d) Briefly describe nectary guides and their purpose. 4
- (e) Name two plants (common names) that have extra-floral nectaries and indicate where on the plant they are found 2

**(a) Label the parts of the flower A - I indicated on the diagram. (Note: not to scale)**

**5 marks**

- |               |                 |
|---------------|-----------------|
| A – Stigma    | F – ovary       |
| B – filament  | G – anther      |
| C – sepals    | H – style       |
| D – nectaries | I – receptacle  |
| E – Petals    | J – pollen tube |

*Half mark for each max 5 marks*

**(b) What is happening at J on the diagram? 2 marks**

1. A pollen grain has been transferred to the stigma and
2. the pollen tubule is growing down through the styles.

*1 mark for each max 2 marks*

**(c) Briefly describe the difference between pollination and fertilisation. 2 marks**

1. Pollination is the transfer of pollen from an anther to a receptive stigma.
2. Fertilisation is the fusion of a male gamete (from the pollen) with a female gamete (in the ovule) to produce a zygote.

*1 mark for each max 2 marks*

**(d) Briefly describe nectary guides and their purpose. 4 marks**

1. Patterns on the flowers provide visual guides to bees and other insects to help them find the nectar
2. They guide the insect into the body of the flower making pollination more likely
3. Many are in the ultra violet spectrum
4. Particularly effective for pollinators that display floral preferences i.e. are loyal to a particular plant such as honey bees
5. Can discourage robbing through holes drilled in the sides of the flower

*1 mark for each max 4 marks*

**(e) Name two plants (common names) that have extra-floral nectaries and indicate where on the plant they are found 2 Marks**

1. Bracken Cherry(prunus) –patches on stem
2. Broad(Field) bean - stipules
3. Laurel - underside of leaves either side of midrib
4. Cherry Plum - Petiole
5. Cherry(prunus) on leaf stalk (petiole)

*1 mark for each example Maximum 2*

- Q13
- |     |  |   |
|-----|--|---|
| (a) | What is fermentation of honey and how would the beekeeper identify fermented honey?    | 4 |
| (b) | List the conditions necessary for fermentation to take place?                          | 3 |
| (c) | Why is granulated honey more likely to ferment than liquid honey?                      | 2 |
| (d) | How can the small scale honey producer prevent fermentation occurring in stored honey? | 5 |
| (e) | What could the beekeeper do with fermented honey?                                      | 1 |

**(a) What is fermentation of honey and how would the beekeeper identify fermented honey?**

**4 Marks**

1. Fermentation is caused when sugar tolerant yeasts feed on the sugars in the honey
2. and produce alcohol and carbon dioxide.
3. Increase volume bulging container or leaking out bottle
4. Frothy in appearance
5. Wine smell

*1 mark per line to max 4*

**(b) List the conditions necessary for fermentation to take place? 3 Marks**

1. The presence of osmophilic yeasts
2. Warmth – ideally 18-21°C
3. Moisture contents above 17% have the potential to ferment if the yeasts are present but above 20% they are very likely to ferment. Honeys below 17% are safe.

*1 mark for each max 3*

**(c) Why is granulated honeys more likely to ferment than liquid honey? 2 Marks**

1. over time the water is released as the honey granulates
2. Sugar tolerant yeasts are able to multiply

*1 mark for each*

**(d) How can the small scale honey producer prevent fermentation occurring in stored honey?**

**5 Marks**

1. Ensure moisture content is below 20% by extracting only capped honey or testing extracted honey with a refractometer.
2. or shake test on combs
3. In bottled honey, heat the honey to 60°C for 1 hour and cool rapidly. This destroys the yeasts as well as the tiny crystals that trigger granulation.
4. Store in cool conditions below the threshold that favours fermentation i.e. 10°C
5. Store honey in full, air-tight containers

*1 mark for each max 5 marks*

**(e) What could the beekeeper do with fermented honey. 1 Marks**

1. Sell it as bakers honey
2. or use it to cook

*1 mark per line, max 1 mark*

Q14 Briefly describe the process required to produce a 454g(16 ounce) block of wax for the show bench starting with fresh wax cappings. 15

**Q14 Briefly describe the process required to produce a 454g(16 ounce) block of wax for the show bench starting with fresh wax cappings. 15 Mark**

1. Weigh mould containing 16oz water and mark level on outside of mould
2. Wash sufficient cappings with soft, clean rainwater and dry
3. The first filter – Tie a piece of lint, fluffy side on the inside, to the bottom of the bottomless food can. Fill the can with the dry wax cappings and hang the can over a basin that contains approximately ½” of soft water. Allow any other suitable suggestion for coarse filtering.
4. Turn on the oven to no more than 70°C and allow the wax to melt. Melt more wax than you anticipate needing to allow for wastage.
5. When all has melted, remove from the oven and allow to go cold.
6. Tip out from the basin and scrape any fine dirt particles from the bottom.
7. Filter again using finer filter paper
8. Once all has melted pour the molten wax into a jug and keep warm.
9. Add 2-3 drops of soft water and liquid detergent and using your finger rub all over the inside of a clean mould until the surface appears dry
10. Place mould in the oven to warm along with a glass sheet.
11. Prepare a bowl with hot water for the wax mould to sit in.
12. Pour the wax into the centre of the mould up to the level required.
13. Remove any air bubbles by touching with a warm skewer.
14. Cover the mould with the hot glass which ensures a smooth even surface to the wax. Leave to cool overnight.
15. Remove the wax from the mould
16. If the wax won't come out the mould either put in freezer or submerge in water.
17. Inspect and weigh the finished article for any specks of dirt and blemishes. A little light polishing may be necessary using some methylated spirit on a fluff free cloth.

*1 mark for each line max 15 marks*

- Q15 (a) List the information required on a label for a 454g honey jar indicating the required information if selling honey. Include any restrictions on the design of the label. 9
- (b) Name 6 of the compositional criteria that a blossom honey offered for sale must possess as stipulated in the Honey Regulations 2015. 6

**(a) List the information required on a label for a 454g honey jar indicating the required information if selling honey. Include any restrictions on the design of the label. 9 marks**

1. Description of the product. 'honey' is a requirement other description is optional but if used must not be misleading.
2. Pictures depicting the product can be used but they must not be misleading
3. The country or countries of origin – just adding the country to your address is not acceptable.
4. Best before date – 2-5 years is generally acceptable for honey
5. Name and address of the manufacturer/seller/producer
6. The weight must be on the label. The weight must be metric (Imperial can follow metric).
7. The minimum height of weight on the label must be 4mm
8. If you are selling the honey through a third party, you must have a lot number (though if your Best Before date specifies day, month and year then a lot number is not required)
9. All in same visual surface except for best before data which can be on lid or base if indicated

*1 mark per point – max 9 marks*

**(b) Name 6 of the compositional criteria that a blossom honey offered for sale must possess as stipulated in the Honey Regulations 2015. 6 Marks**

1. Fructose and glucose content not less than 60g/100g
2. Sucrose content not more than 5g/100g
3. Moisture content not more than 20%
4. Water insoluble content not more than 0.1g/100g
5. Electrical conductivity not more than 0.8mS/cm
6. Free acid not more than 50 milli-equivalents acid/kg
7. Diastase activity (Schade scale) not less than 8
8. HMF not more than 40mg/kg
9. Must not be fermenting
10. No additions to the honey including food additives

*1 mark per line – max 6 marks (only first six answers to be marked)*

## Section C

- Q16 (a) Starting with a 14kg (30lb) bucket of granulated mixed summer flower honey describe the process to hygienically produce a seeded soft set honey for sale in jars. 15
- (b) A beekeeper would like to produce and sell chunk honey. Describe the planning process that is required. What are the main considerations when deciding what honey to use and what crops to target to produce this product? 15

**(a) Starting with a 14kg (30lb) bucket of granulated mixed summer flower honey describe the process to hygienically produce a seeded soft set honey for sale in jars. 15 Marks**

1. Place bucket of granulated honey in honey warming cabinet for 24-36 hours at 50°C 122°F stirring occasionally
2. If the honey has not already been filtered it will need filtering.
3. Cool to 35°C
4. Warm the seed stock to 35°C
5. The seed stock can be from a previous batch of honey that was at the desired consistency/texture
6. Need approx. 10% of seed stock – i.e. 3lbs
7. Add the seed stock to the bulk honey and stir gently but thoroughly.
8. Aim is to mix well without introducing air bubbles which will cause a frosting appearance.
9. Apparatus for mixing include electrically operated corkscrews or hand operated creamers
10. Stand over the next 12 to allow bubbles to rise
11. Bottle while it is still runny enough to pour
12. Weigh
13. Store at 14°C to encourage it to set
14. on a level surface
15. Labelling according to the regulations

*1 mark each line Max 15 marks*

**(b) A beekeeper would like to produce and sell chunk honey. Describe the planning process that is required. What are the main considerations when deciding what honey to use and what crops to target to produce this product? 15 Marks**

For the Comb chunk

1. Choose suitable strong colony – white cappings
2. Use second super to avoid pollen
3. Use of thin unwired foundation or starter strips
4. Need strong nectar flow to produce cut comb – can use off cuts from cut comb production
5. Select a honey that will not granulate readily – definitely not rape honey. Heather is a good option
6. Remove as soon as comb is capped to reduce staining as the bees travel over the combs
7. Use a freezer to store chunks

Liquid part

8. Need a light honey that doesn't granulate –eg Borage Looks better if lighter than the comb.
9. Heated to 60°C (145°F) to remove crystals and then cooled quickly

Choice of jar

10. Good presentation is key so choose an attractive jar
11. Comb will float so cut a generous piece that fills the jar and then the lid can be used to hold it down
12. Think about where the label will go as it could hide the chunk which won't look as good



Labelling requirements

13. labelling requirements Chunk Honey must be stated

14. Consider size and design of label to show off product e.g. clear label that you can see through

Selling

15. Direct quick sale is preferential as the honey may granulate

*1 mark each line max 15 marks*

- Q17 (a) Give an account of the physical and chemical processes employed by honey bees to convert nectar to honey. 10
- (b) List the typical components of honey and give the average percentage of each component found in typical UK blossom honey 12
- (c) Give the reasons that make the honey bee an effective pollinator. 8

**(a) Give an account of the physical and chemical processes employed by honey bees to convert nectar to honey. 10 Marks**

Physical

1. Nectar collected from flowers and transported back to hive in her honey stomach (crop)
2. Greeted by a worker bee on arrival at hive who receives the nectar load from her and deposits it in a cell within the brood nest
3. Worker bees in the storage area then go about the process of reducing the water content. They take drops of nectar onto their proboscis and roll it up and down to expose it to the warm temperatures of the brood nest and to increase its surface area – water evaporates off.
4. Hang nectar in empty cells to reduce water content
5. May fan to create an air flow
6. Until desired water content is reached – approx 18%. Bees remove excess water from the hive by fanning and creating air currents
7. Once honey is ripe cells can be sealed- capped

Chemical

8. At the same time while the bee is taking nectar into her honey stomach adds enzymes to break down the sugars
9. chemical changes are taking place Sucrose + water  $\leftrightarrow$  glucose + fructose
10. Invertase is produced in hypopharyngeal glands and is added to nectar by foraging bee when it is collected. The processing bees add a bit more to continue the process. Invertase splits sucrose to glucose and fructose.
11. Glucose oxidase is also produced in hypopharyngeal glands and is added by foraging and processing bees. It breaks down glucose to hydrogen peroxide and gluconic acid.

*1 mark each line max 10 marks*

**(b) List the typical components of honey and give the average percentage of each component found in typical UK blossom honey. 12 marks**

Constituent	%
<b>Water</b>	<b>17-19 (allow 16-20)</b>
<b>Fructose</b>	<b>38-40</b>
<b>Glucose</b>	<b>31-35</b>
<b>Sucrose</b>	<b>1-3</b>
Other sugars	8
Total acids	0.5
Ash	0.09 – 0.33
Nitrogen	0.04 – 0.05

*12 marks – 1 for constituent and 1 for %. Must include top 4 from list to get 8 marks and then 4 marks for any of the others*

**(c) Give the reasons that make the honey bee an effective pollinator. 8 Marks**

1. they remain faithful to one flower type when foraging
2. the honeybee is covered in hairs to which pollen sticks
3. because honeybees overwinter as a relatively large colony there are significant numbers available for pollination early in the year.
4. honeybee colonies can be moved in large numbers for pollination of particular crops.
5. honeybees recruit large numbers of foragers when scout bees find a source of nectar/pollen.
6. honeybees forage for both nectar and pollen, pollen being essential for brood rearing
7. honeybees visual range allow them to see ultra violet so that they can recognise “nectar guides”.
8. honeybees leave a scent mark which tends to attract other bees to that particular food source

*1 mark for each from the list to a max of 8*