Revision Notes for the Basic Assessment

General introduction:

The Basic Assessment is designed to find out if you are an effective beekeeper, can keep your smoker alight and are able to control a colony.
This is a practical assessment (not a written one) and will take about one hour.
There are four parts to the assessment:

- Manipulation of bees, where you look through a hive with the Assessor and interpret what you see.

Part of this section means being required to assemble a frame, so bring along the wooden parts of a super, plus foundation, hammer and nails.
Then there will be oral questions on:

- The life cycle of your bees and beekeeping through the year.
- Swarming and a method of swarm control.
- Diseases and pests.

25 marks are available per section, and you must achieve 50% in each section to pass.

The syllabus and application forms are available on the BBKA website www.bbka.org.uk in the Member's Area.
Your application form must be authorised by your Branch Education Secretary.
The cost of taking the Assessment is £25
The examiner will contact you to arrange time and place, usually at your own hives/ your Teaching Apiary.
This will be between May and August.

Candidates must have kept bees for 12 months.
The swarm control section is important and the method of swarm control that you describe must work.
You must be able to describe when brood is normal and (therefore) when it is not normal or diseased and know where to go for help when there is a problem.
You must also be able to see eggs. (Use a magnifier and/or torch if you need to)
Health and Safety requires that there is a third person on site during an assessment in the event of an accident so you will be asked to bring a friend or relative along unless it is held in the Teaching Apiary at a time when there are other people around.

You do not get the results on the day; the examiner contacts the BBKA Education Secretary, and you usually get results within a couple of weeks.
The pass mark is 50%, a credit is awarded to 75% or more and a distinction if marks achieved are over 90%.

Book list recommended by BBKA:

Reading for Basic Assessment		Publisher
Better Beginnings for Beekeepers.	A. Waring	BIBBA
Get Started in Beekeeping.	A & C Waring	Hodder Education
Medical Aspects of Beekeeping (2000).	Dr H Riches	NBB
BBKA News, Special Issue Series – 'In the Apiary'.		BBKA

Two recommended publications both by Ivor Davis and Roger Cullum-Kenyon

Guide to Beekeeping	BBKA
BBKA Healthy Hive Guide	BBKA

General reading

Guide to Bees and Honey (5th. edition) (2010).	Ted Hooper	NBB
Haynes Bee Manual (2011) .	A & C Waring	Haynes
Practical Beekeeping (1997).	Clive de Bruyn.	Crowood Press
The BBKA Guide to Beekeeping .	I Davis/R Cullum- Kenyon	Bloomsbury
The Biology of the Honey Bee (1987).	M. Winston	Harvard
The Honey Bee Around and About.	C Davis	Bee Craft
The Honey Bee Inside and Out.	C Davis	Bee Craft
Beekeeping Study Notes for the BBKA Examinations in 6 vols		J.D. & B.D. Yates NBB
National Bee Unit disease leaflets on: Varroa, Foul brood, SHB, Tropilaelaps		www.nationalbeeunit.com

Revision Notes for the Basic Assessment.

1. Manipulation and Equipment.

1.1 Care needed when handling a honeybee colony.

Handle bees gently and quietly. Bees get upset by bangs or thumps on the hive and can be attracted towards quick movements of your hands and become defensive.

Make sure you are properly clothed and have a smoker and hive tool.
It is safer and more fun if you look at bees with a friend so try and team up with a local bee-buddy.
The best time to look in a hive is in the middle of the day when many of the bees are out foraging – 11am-3pm.
Avoid looking on a heavy thundery day when they are likely to be grumpy.

Opening the colony:

- Smoke the entrance or puff through the mesh floor and leave a for couple of minutes.
- With gentle movements and using the hive tool, carefully remove the roof and place it upside down in front of the hive and place the crown board and supers on top. (Keep the honey clean at all times).
- Then remove the queen excluder, checking that the queen is not on the underneath surface.
- Commence looking through the brood box, working from one side to the other being careful not to roll bees.
- Use a cover cloth if preferred.
- Hold frames vertically and hold over the hive in case the queen or honey drops off. (Learn the technique of pulling out a frame vertically then dropping one side and turning round it to see the other side).
- After examination, re-assemble the hive without damaging any bees, making sure the queen excluder is the right way up (re the bee space).

1.2 Reactions of honey bees to smoke

Smoke is commonly used to subdue bees. The reaction of bees is to fill themselves with honey. It will also confuses the transmission of pheromones. The guard bees are reduced, and aggression minimised.
Normal behaviour resumes once the smoke has dissipated.
A fine water spray can be used instead of smoke.

Beekeepers use a bent nosed smoker with a bellows attached to produce the puffs of smoke.
Choose a large smoker which will hold plenty of fuel. The fuel needs to smoulder with a cool smoke. (not make flames which will injure bees).
The smoker is usually lit with newspaper, or a gas lighter then kept burning with a convenient fuel such as cardboard, wood shavings or cardboard egg boxes.
It is important for your safety that the smoker stays alight all the time you are working with the bees.
Use the *appropriate* amount of smoke to be effective in any given situation eg. You will need less if the weather is fine and most of the bees are out foraging, but more smoke may be required if it is a cold day.
First puff smoke through the entrance or mesh floor. Leave for a short time so it registers throughout the hive. After opening the hive, smoke gently to move the bees away from your area of work.
If you are looking for the queen, use as little smoke as possible, otherwise she will be running a couple of frames ahead of you all the time.

1.3 Personal equipment and the importance of cleanliness

Protection is paramount and clothing should be clean.
Essential clothing required when you open hives would be a veil, overalls, washable gloves, and wellington boots.
Plus, a smoker, fuel and matches and a hive tool. (Rule No 1: Light your smoker *before* you put your veil on.)
For the Assessment you will have to take a sample of bees to test for disease. You might need to bring a super frame to make up. See section 1.15
A bucket with water and washing soda (to clean tools), scourer and towel.
A mobile phone is a good idea for safety purposes.

Other equipment you might need:
Container for bits of scrap wax.
Spare hive tool.
Record cards, notebook and biro.
Small knife. (cont'd)

Drawing pins.
Queen marking kit and small scissors.
Queen cage, paper and elastic band.
Spare spacers.
Parcel tape.
Means of narrowing or closing the entrance (eg. Wooden blocks or pieces of foam).
Cover cloth.

Items you may be carrying for particular reasons:
A nucleus box.
Frames of foundation.
Means of feeding syrup or fondant to the bees.
For a swarm: skep and cloth, secateurs.
Grass hook.
Hive strap.
Small spirit level.
Small hammer and nails.

Get a lightweight kit box from a DIY store so that it is easy to keep your tools together, ready to pick up and go. Cleanliness with your kit is very important so as not to spread disease. See section 4.2.

1.4 Reasons for opening a colony

Colonies are examined between April and October. During the winter the bees are best not disturbed.

The things you are looking for in a hive will be the same throughout the year, but the emphasis will vary according to the season.

- Is there a queen present? This can be confirmed by seeing eggs.
- Are there any queen cells containing eggs on the comb? If so, you must start swarm control.
- Does the colony have enough space a) for the queen to lay and b) for the bees to store nectar?
- Does the colony have enough food to last until your next visit? Minimum of 10lbs.
- Check for signs of disease. Is the colony building up as you would expect? How does the brood pattern look? Are there any abnormalities?

1.5 The need for stores

The reason bees build up their honey stores in the summer is because (contrary to bumble bees and wasps) the whole colony lives through the winter and will need feeding when there are no flowers around and when it is too cold for the bees to fly.

- Nectar is a weak sugar solution, produced in the nectaries of flowers, which the bees use to make honey and which they transport in their honey stomachs It is the carbohydrate which fuels all the bees' flight.
- Pollen is collected from the stamens of flowers and carried back to the hive on the back legs of the worker bees in their pollen baskets. It supplies the protein element in the bee's diet.
- Bees do not store water so always need a source of water near the hive.

1.6 Record keeping

Why keep hive records?
1 Colony management.
2 Comparative assessment of hives.
3 Queen rearing and assessment.
4 Specific scientific projects.

Record cards should be simple and easy to understand and show the state of the colony each time it is inspected. Each hive should be identified (position/number etc).

<u>Information on your record card:</u>
You need historical data on the queen, including:
Age.
How acquired.
Pedigree.
Is she marked or clipped?

You need observations on the condition of the colony on the day:

Date of visit
Is the queen present. Seen? Laying?
Quantity of brood. Ie. eggs, larvae and sealed brood.
Are there any queen cells?
Is there room for the queen to lay?
Is there enough room to store incoming nectar?
Quantity of stores available in the hive?
Some measure of the temperament of the bees.

Further notes may record:

Weather and temperature.
Nectar flow.
Supers added.
Honey taken.
Things you will need for next inspection.
Treatments or varroa tests.

It doesn't really matter what form the records take. Pen and paper on a card left under the roof, notes in a book or dictated into a mobile phone and kept as computer records, but the main thing is to keep doing them.

You are legally required to keep:

- Medicinal records of any treatments given.
- Records of your honey sales showing Lot Numbers.
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1.7– 1.14 This part of the syllabus refers to the practical session when candidates are required to look through a brood box, identifying what they see and answering some questions from the examiner and will be covered in a practical session with experienced beekeepers.

1.15 A sample of bees may be needed to detect *adult* disease and you may have to demonstrate how to take one.

You will require an empty matchbox (a large 'cook's' box is ideal) and a piece of clear plastic.

These bees must not be taken from the brood area as they will be too young to have developed the infection you are looking for. Samples must be taken from the outer combs of the brood box where the bees will be older or you could temporarily block the front of the hive and take your 30 bees from the gathering crowd of returning foragers. (A sample of 30 bees will statistically give you a 90% chance of finding a 10% infection).

The bees are usually collected in a match box. Half open it, drag the open drawer across a group of bees and carefully close it. By opening the drawer of the matchbox under the piece of plastic / glass you can see that you have the number of bees required.

1.16 You need 30 adult bees for an adult bee disease diagnosis

1.17 Learn to shake each brood frame clear of bees while lifting it halfway out of the hive. By doing this the bees will fall neatly back into the hive. When examining the brood for AFB, you hold the frame at waist level and look from the top down (on both sides) in order to see any dead and dried out larvae, resulting from AFB, which due to the nature of the disease are stuck to the bottom of the cells.

NB. Bees that have died from EFB go dry, are loose in the cells and are usually cleared out by the bees)

1.18 Know the function of the floor, brood box, queen excluder, supers, feeder, crown board and roof.

1.19 The bee space is the space that the bees create to move around in the hive. It is approx 8mm wide and allows two bees to work back-to-back between combs. Any wider and they will create comb, any smaller and spaces are likely to be filled with propolis. This principle was discovered by Langstroth in 1851 and this knowledge allowed beekeepers to build efficient wooden hives.

1.20 As part of the assessment you are required to make up a brood frame. Make sure you are clear as to whether the wax and frame parts are supplied or whether you must bring them with you.

1.21 Methods of keeping brood frames evenly spaced apart are:

Using self-spacing Hoffman frames which allow 11 frames in a national hive.

Using regular frames and placing small plastic or metal spacers on the lugs.

Using metal castellations to hold the frames in place.

The spacing in *supers* is more flexible and once drawn, can be moved further apart allowing bees to draw the comb out even further (= less frames to extract). You can also use super Hoffman frames, Manley self-spacing frames (10 in a super) or regular frames with wide spacers.

2. Natural History and Beekeeping

2.1 Account of development of queens, workers and drones in the honeybee colony

The queen is the egg layer in the hive and mother of all the other bees.
She develops from a female egg laid in a large queen cell which sticks out from the comb and hangs vertically.
It takes 16 days from the egg being laid to the emergence of a queen bee.
She is fed a special diet by the nurse bees which includes copious amounts of royal jelly. Her caste is determined by the better quality and greater quantity of food given to her. (extra sugar and extra hormones / royal jelly)
A week or so after emerging from the queen cell she will go on multiple mating flights. In the early afternoon, in good weather and when the temperature is over 20°C. Some 2-3 flights a day.
She mates with 7-17 drones over several days and can then store the sperm in her spermatheca.
If the mating is postponed for more than four weeks (eg. poor weather) she will not be viable.
A week after mating she will commence laying fertilised female eggs in worker comb and unfertilised male eggs into drone cells. 2000 per day in the height of summer but little between October and February.
She will only leave the hive thereafter if the colony swarms.
She can live for up to five years but is usually kept for 2-3 by beekeepers as fertility lowers after that.

The workers are females and are unable to mate, their ovaries are suppressed by pheromones from the queen. They take three weeks to develop from egg to adult and once emerged, the first three weeks are spent in the hive while their bodies mature. They undertake various tasks as their glands develop:

- Cleaning and capping cells.
- Feeding brood.
- Attending the queen, feeding and grooming her and receiving pheromones.
- Receiving nectar and pollen from the foraging bees, packing it into cells.
- Comb building when their wax glands mature.
- Manage ventilation for evaporation of nectar or cooling the hive.
- Guarding the entrance as the sting matures.

Then fly as foragers for about three weeks in summer and do all the work in the colony.
Initially the young workers will go on short orientation flights but are soon on foraging duties.
Worker bees collect nectar and bring it back to the hive in their honey stomach. Water is also carried in the honey stomach (separately). Pollen baskets on their back legs carry pollen and propolis.
The bees will dance if they find a good source of nectar and can indicate both distance and direction of the flowers to the other bees.
The amount of work a bee does is more relevant to her life span than age. Her wings wear out after about three weeks of hard work in summer. Autumn born bees will survive six months through the winter because they have much less time flying, surviving to raise the new brood in spring.

Drones are the males**.** They develop from an unfertilised egg and are only raised in spring and summer.
Their primary role is to mate with the queen. They live for 2-3 months and do not have a sting.

After emerging they are fed by the nurse bees for the first few days then the older drones feed themselves.
Their reproductive organs take two weeks to mature then after some orientation flights they go on mating flights, some 3-5 each day, returning to the hive to rest and eat between flights.
They are strong fliers and have good eyesight and very sensitive antennae – all for finding flying queens.
If they mate successfully, they will die leaving part of their innards in the queen, otherwise they live on until September at which point the workers push them out of the hive and don't let them back in so they subsequently die.

2.2 Number days of development before emerging as an adult bee.

	Worker	Queen	Drone
Egg	3	3	3

	W	Q	D
Larva	5	5	6
Pupa	13	8	15
Total days	21	16	24

2.3 Local flora

What bees need is a consistent supply of flowers to visit throughout the season. Trees being especially valuable.
For example:
Early bulbs include: Crocus, Grape Hyacinth and Snowdrop.
Mahonia.
Willow.
Dandelion.
Sycamore.
Oil Seed Rape.
Horse Chestnut.
All the top fruit eg. pear blossom, plum, apples and cherries.
Clover.
A wide variety of garden flowers and herbs in summer.
Blackberry.
Lime trees
Rose Bay Willowherb.
Himalayan Balsam.
Heather.
Ivy is one of the last of the year.

2.4 Nectar

Plants produce nectar in their flowers to entice insects to visit them and assist in pollination.
Nectar is a sugary solution which provides energy for the bees (particularly for flight). They gather large quantities and store the excess as honey to provide for the colony over the winter when there is no forage.
A colony in a National hive will require 35-40lbs / 15-20 kilos of stores to survive the winter.
The concentration of the sugar in nectar can vary from a weak 5% to 30%.
The presence of a queen and brood in a hive stimulates nectar collection by the workers.
Approx 1/3 of the population are foragers and 2% of these are scout bees looking for new sources of forage. Bees will collect the nectar with the highest sugar content and will dance to communicate to the others when they find a good source.
Nectar is carried in their honey stomach where the enzyme invertase is added to break up sucrose into the simpler sugars: fructose and glucose.
At the hive it is passed to the young house bees who evaporate it down until the water content is only 18% (at which point it won't ferment) and then they store it in the cells in the comb and add a wax lid to preserve it and keep the damp out.
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2.5 Pollen, water and propolis

Pollen
Pollen is the male part of the plant. Because plants are static, they need help to move the pollen to the female part of the flower in order to make seeds. Nectar is produced to lure insects to do this job for them. Insect visitors pick up pollen on their hairy bodies and distribute it to other flowers for pollination and seed production.
Pollen is collected by the bees for their own nutrition as it contains minerals, vitamins and fats and is a source of protein for the growth of larvae and for feeding the queen.
Pollen is also needed for wax production, to make the fat bodies for winter and to produce venom.
It is carried in the pollen baskets on the rear legs of the bees and house bees then pack it into the cells.
It can range in colour from black to brown, orange, yellows and beige to blue and green depending on the flower source.

Water
Water is not stored but collected by bees as it is required. It is needed for:

- digesting food and general metabolism. Honey needs to be diluted to 50% sugar to water to be consumed.
- nurse bees to produce larval food (66% water).
- temperature regulation.
- humidity control.

Propolis
Made up of plant resins which are collected by worker bees from trees especially poplar, horse chestnut and pine. Propolis is anti-bacterial and anti-fungal is used for covering the interior surface of the hive as well as for filling small holes and cracks. Bees can use it to reduce the size of the entrance.
Propolis is carried back to the hive in the pollen basket and unloaded by the house bees who use it straight away.

2.6 How the colony passes the winter

To winter well you need plenty of young bees, adequate food and protection from the elements.
One reason beekeepers try to keep younger queens is because they lay eggs later into the autumn.
The queen will cut right down on egg laying in late August so the population drops dramatically.
The drones are driven out of the hive in the autumn.
Treat bees for Varroa in Sept and feed them, if necessary, with sugar syrup in October.
Bees will have eaten a lot of pollen to build up the fat bodies in their abdomens.
Well-prepared hives do not need to be looked at between November and March.
As the temperature drops bees will eventually form a cluster or ball in the centre. Within the cluster they will consume honey and produce warmth to keep the colony alive. The centre of the cluster will be about 20°C and the cold bees on the outside will rotate to the middle.
The queen will begin to lay a few eggs again by mid-January as light levels increase and then the new larvae in the centre must be fed and kept at 34.5°C.
The beekeeper will notice that the colony is smaller in the spring as many older bees will have died over the winter.
As the outside temperature warms up in spring the cluster will loosen up and start to fly on warm days. Much larger supplies of food are eaten and the queen's egg laying increases.

2.7 Setting up an apiary

Things to consider:

- Decide on which type of hive you will keep and then stick to it so that all your kit is interchangeable.
- The apiary needs to be sited so as not to be a problem with the general public ie. hives should be placed so that the entrance is not close to footpaths and roads, with fences or shrubs positioned to raise the bees flight path. Possibly fenced round with a gate that locks? Have a sign with your phone number on?
- A sunny spot, not in a frost pocket or very windy.
- A discrete site which is out of the way to minimalize vandalism.
- Convenience for the beekeeper. If not in the garden, the apiary needs road access to get a vehicle close by to bring equipment or remove supers of honey.
- Plan to prevent drifting, hives in a circle are considered the best arrangement.
- Consider local flora available for a good nectar yield, especially early forage like willow trees.
- If there is no water source nearby the beekeeper needs to supply one.
- Hives need to be on stands of an appropriate height (about knee level) so that there is not too much bending by the beekeeper.
- A maximum of 10 hives in one apiary is considered best practice.

2.8 Avoiding nuisance

- Keep well-tempered bees.
- Site hives with regard to the public (see 2.7).
- Fence round hives if livestock are in the same field.
- Put your phone number on out apiaries.
- Check bees regularly and do not let them swarm.
- Do not have too many hives in an apiary.
- Conduct good apiary hygiene and do not start robbing as one hive can soon upset the others.

2.9 Possible effects of stings on humans and recommended first aid

A honeybees sting is barbed and will hold fast when bee flies away (the bee will eventually die).

Once a honeybee has stung someone, the sting, along with the venom sac, are pulled out of her body and remain in the victim (still pumping venom).

- You should quickly scratch aside the sting (rather than pinch, squeezing more venom into the skin).
- Smoke the area stung to mask the sting pheromones which attract more bees.
- Close the hive and move away quietly.
- Monitor the person who has been stung to make sure they are not going to have an allergic reaction.

Reactions to a sting can be

- **Local reaction**: Some people react very little apart from the initial pain of the sting.
- .**Mild reaction**: Most react with initial pain and then red swelling round the sting which can be itchy for several days. Aspirin and antihistamines can help.
- **Severe allergic reaction** does happen occasionally and must be taken very seriously. The victim can go into anaphylactic shock which means a major medical emergency.
  They might be lightheaded or dizzy, have swelling and much increased redness of skin (including red lines or spots (urticaria) in areas other than the sting). They may have swelling of the tongue or in the throat.
  If a person is stung and in distress, with difficulty breathing and losing consciousness they should be placed in the recovery position, an ambulance called and if necessary, resuscitation given.
  Allergic reactions can also happen to experienced beekeepers who have been OK with stings in the past.

It is always a good idea to have a mobile phone with you at an out-apiary and know the address and postcode.

2.10 Annual cycle of work in the apiary

We generally think of the beekeeping year as starting after removing the honey.

<u>September</u>
Check for disease especially if you are uniting colonies for the winter.
Make sure you have *appropriate* sized entrances.
Check hives to make sure they are waterproof.

<u>October</u>
Feed colony if necessary, to ensure a minimum of 35lbs/ 16 kilos of stores are available for the winter.
Remove queen excluder.
Protect hives from mice and woodpeckers.
Provide ventilation.

<u>November to January</u>
If you are treating bees for varroa with oxalic acid it is best done between Christmas and New Year when there is no brood.

<u>February to March</u>
Check your hive and feed fondant or a light sugar syrup if necessary. (Equal quantities of sugar and water)
Start cleaning and preparing equipment for the season ahead.
Put out hornet traps.

<u>April to May</u>
Carry out first inspections on a warm day (shirt sleeve weather).
Clean and replace hive floors.
Check for adult brood diseases.
Replace any old or damaged brood combs.
Increase width of entrance as necessary.
Add additional supers as colony expands.
Decide which swarm control method you are going to use and check you have enough equipment.
Start swarm management as soon as you see an egg in a queen cell.

<u>June</u>
Extract spring honey if bees have access to oil seed rape.
Continue swarm management.
Be aware of shortages of food in June gap.

July
Continue providing additional supers as required.
Keep an eye on numbers of varroa mites.

August
Remove honey from hive.
Extract and strain honey, store in food grade containers in a cool place.
Once the honey has been removed treat colony for varroa. Eg. With Apiguard or Maqs strips
Restrict hive entrances to prevent robbing.

2.11 How and when to feed bees

Bees need to be fed if they are short of stores. This could be spring, summer or autumn if the weather is poor.
Feeding for winter must be done by the end of October. Any later and it may be too cold for the bees to collect and process the feed.
There must be enough stores in a hive to last until your next visit, (whether that is next week or next spring)
A National hive will require 35lbs/16 kilos of stores to last the winter.
Feeding must be done without initiating robbing -therefore feed in the evening, without spills etc.
Reduce entrances making them easier for the bees to defend.
Syrup and fondant must be made from white sugar as brown sugar gives bees dysentery.
Never feed honey other than your own to bees because of risk of introducing disease.
Never *ever* feed foreign honey.

Reasons to feed

- Emergency. To prevent starvation in a poor season.
- Autumn feeding to replace honey taken by the beekeeper.
- When preparing nucleii.
- Queen breeding.
- Taking care of swarms.
- To stimulate comb building.

What to feed

- The simplest is to transfer a comb of honey from one hive to another (beware of spreading disease)
- Sugar syrup can be fed to the bees. A stronger solution is normally used in autumn when you want to feed the bees rapidly and give them less work to evaporate the water. This is made in a ratio of 2 parts sugar to 1 part water, mixed until the crystals have dissolved. Eg 2 kilos of sugar to 1 litre of water. Alternatively place sugar in pan, mark level on side of pan, add water to that level and stir. Warm water will speed up the sugar dissolving.
- A weaker sugar solution would be given in spring in the ratio of 1:1, which the bees could use immediately.

How to feed syrup
Syrup can be fed via Miller Feeder or Brother Adam Feeder, essentially a box placed on the hive above the brood which allows the bees to access the syrup without drowning. You could also use a contact feeder such as plastic container with small holes pierced in the top which is inverted and placed over the brood area or alternatively use a division board feeder which goes amongst the brood frames.

Fondant looks like icing. It can be bought in plastic bags and placed above the brood nest after a few cuts to the bag for the bees to gain access. It is useful when bees cannot fly eg early spring, but bees do need water to dissolve it to the right consistency.
It is not difficult to make yourself:
5 parts white sugar to 1 part water.
Boil for two mins and stir until cloudy and cooling a little.
Pour into containers, such as margarine tubs, lined with foil. You can then lift out the complete block of candy which can be inverted over the hole in crown board. The foil will keep the outside dry.

2.12 Adding supers

Supers are added to the hive above the queen excluder.
The first super is added early in the season – preferably filled with drawn comb, in April.
Further supers will be required as the colony increases.

The time to add the next one is when bees have filled six to eight combs in the prior super.
Better to add too soon than too late, as fresh nectar takes up more room than honey and lack of space is one reason bees swarm.
Bees are reluctant to move up to a new super of foundation unless it is warm, so attract them by inserting one drawn comb in the centre if you have one.
Supers that have been extracted are put back on the hive for a few days for the bees to clean up, then removed and stored for the winter.

2.13 Robbing

Honey bees are opportunistic and will rob other hives. This usually happens when there is a shortage of nectar.
It is very important that the sizes of the entrances are appropriate and not too big for the bees to defend.
Robbing can happen when you return extracted combs to the hive. The strong honey smell excites the bees in adjacent colonies who start hunting for it. It is therefore best to return supers in the evening.
Once robbing starts weak colonies and nucs are at risk.
Robbing bees have a particular zig-zag / hawking flight in front of the hive which is recognisable.
Bees who rob often fly later in the day so you will see them when normal flight has ceased.
Wasps will also rob hives and can destroy a weak colony.

Prevention
Robbing is often the beekeepers' fault.
Reduce entrances when returning wet supers.
Be tidy. Do not spill syrup in the apiary and do not leave bits of wax on the ground.
Feed bees in the evening when they have mostly stopped flying.

2.14 Method to clear bees from supers

You know a super is ready to be extracted when at least ¾ of the honey is capped.

- You can shake and brush combs individually to remove bees. This is slow and you need an extra super.
- You can place a clearer board underneath the super to be extracted. There is a valve arrangement in the board which allows bees out of the super but unable to return. This method requires four visits to the apiary as the board gets placed on the hive with supers to be extracted above, and then the beekeeper returns 24 hours later to collect bee-free supers. After extracting, the empty combs are returned to the hive for the bees to clean up and the beekeeper will collect them a couple of days later and take them away to store for the winter.
  There are several designs of clearer board including the Porter Bee Escape and the Canadian Board.
- Some professional beekeepers use a mechanical blower to clear bees from supers.
- There are also chemical repellents to make bees move away from an impregnated board or cloth.

2.15 Extracting and bottling honey. Hygiene

The room used for extracting needs enough space to stack supers and accommodate a table or surface for uncapping and have room for the extractor as well. It should be laid out so that you are not tripping over kit. There needs to be a clear path of work from start to finish.
Hygiene is very important: The premises must be clean and constructed of material that can be cleaned.
A water supply and washing facilities will be required.
Bees must be kept out – so keep windows shut, and you will need good lighting and ventilation.
It is best to extract soon after combs come off the hives as it is much easier while the honey is still warm.
You will require:

- An arrangement for uncapping the combs. Usually, a couple of serrated knives and hot water in a deep jug, plus a container for the cappings. Hot air paint strippers remove cappings well.
- An extractor, which you would probably borrow from your Association to start with. This must be made from food grade plastic or stainless steel. They work by centrifugal force and can be manual or electric and can have a tangential or radial arrangement for the combs.

Once extracted, the honey then needs to be strained or filtered.

- Left in a settling tank for bubbles to rise.
- Put into food grade containers for storage, typically 30lb buckets or jars.
- Honey will need to be stored in a cool place, preferably below 14°C.

2.16 Web Resources

Hierarchy in the beekeeping world
In the UK Government bees come under the auspices of The Animal and Plant Health Agency (APHA)
The National Bee Unit (NBU) is managed by APHA and is at Sand Hutton, York YO41 1LZ.
www.nationalbeeunit.com Their main concern is bee health plus some training.
The country is divided into regions, each of which have a full time Regional Bee inspector, and then Seasonal Inspectors who are employed for the beekeeping season.
Regional Bee Inspector for Avon:

Megan Seymour	07775 119475	megan.seymour@apha.gov.uk

Our Seasonal Bee inspector for 2024

Donald Mudie	07443 255651	donald.mudie@apha.gov.uk

The NBU also publishes a number of advisory leaflets and fact sheets on many bee related subjects as well as disease http://www.nationalbeeunit.com/index.cfm?pageid=167 which are very helpful.

If you keep bees, please register on the NBU site https://secure.fera.defra.gov.uk/beebase/public/register.cfm
You will be alerted of any serious diseases in your area.

British Beekeepers	www.bbka.org.uk
Avon Beekeepers	www.avonbeekeepers.co.uk
Bath Beekeepers	www.bathbeekeepers.com

www.somersetbeekeepers.org.uk our neighbours in Somerset have an educational section and some video guides
www.dave-cushman.net Run by Roger Patterson
There are many practical videos on Youtube about beekeeping.

Two bee charities based in Britain:
www.beesfordevelopment.org
https://beesabroad.org.uk

As a member of BBKA you receive the magazine BBKA News and you can also subscribe to BeeCraft magazine. Both provide interesting articles and up to date news.

3. Swarming, swarm control and effects

3.1 Elementary description of swarming in a honey bee colony

Reasons why bees swarm:
Bees swarm due to lack of queen pheromone

- Overcrowding of bees in the hive hinders efficient distribution of queen pheromones so worker bees are not receiving queen substance and start making queen cells. Therefore, lack of space must be addressed by the beekeeper -who must keep adding supers as needed.
- Swarming is much more likely to happen if the queen is old and the production of her pheromones is decreasing. A reason to keep young queens.

Swarming usually happens in the middle of a warm day in spring (April, May, June) when there is a high proportion of young bees in the hive and an abundant supply of nectar and pollen.

Workers will start to construct queen cells when the above reasons combine to give the greatest opportunity for survival of both the existing colony and the new swarm.

The swarm
The prime swarm will fly away when the queen cell is CAPPED (NB. *not* when the new queen emerges).
The old queen's feeding will be reduced, resulting in her ceasing egg laying.
Workers will fill their honey stomachs with honey to provide food for the new home.
On a fine day they run about excitedly whirring their wings and will push the queen towards the entrance and out.
The swarm consists of a large proportion of the flying bees, the current queen and a few drones.
The population left in the hive consist of eggs, larvae, young nurse bees and immature queen/s.

Phase 1
The swarm alights on nearby tree/shrub etc, usually within 25 metres of the hive, on a branch/wall/hedge, etc
Queen pheromones attract all the flying workers and hold the swarm together.
(If the queen is clipped she will fall to the ground unable to fly, the bees will realise she is missing from the swarm and return to the hive. The advantage of clipping is that the beekeeper has a few extra days before the next swarm emerges with a new virgin queen).

Phase 2
While the swarm hangs from the branch, scout bees will fly and seek a new nest site and on finding a cavity of 40 litres or so in volume will return to the swarm and dance to indicate the direction and distance, recruiting other bees to inspect it. The recruits subsequently dance, and this continues until a consensus is reached.

Phase 3
The swarm will fly en-masse to their new home encouraged by the scouts who do streaking flights to indicate direction.
On arrival bees soon enter their chosen cavity, leaving some fanning their Nazenov glands at the entrance to attract stragglers. They quickly begin comb building and food gathering.
If the queen is a virgin, egg laying will be delayed until after mating.

3.2 Account of one method of swarm control

Swarm control by the beekeeper starts as soon as an egg is found in a queen cup.
Usually in April, May or June.
The beekeepers' life is much easier if the queen is marked and clipped.
An extra hive will be required.

The beekeeper usually makes an artificial swarm by splitting the colony into two to prevent loss. They want to keep the old queen and retain all the workers to continue to forage.
The manipulation must work round the fact that the workers flight path is inflexible. They will always return exactly to the hive entrance.

- Move the hive with queen cells away from its stand.
- Put a fresh hive in its place with (preferably) drawn combs in the brood box. Find the queen and place her and the comb she is on in the centre of this new hive, making sure there are no queen cells on the comb. Place any supers that were on the original hive above a QX on this new hive or feed if necessary.
- Go to the original brood box and remove all but one or two queen cells (preferably open ones). Feed if necessary.
- One week later it is important to inspect the hive containing the original queen to make sure the bees have not built more queen cells. If they have, the cells must be destroyed otherwise the bees will swarm again.

The colony on the original site now consists of the old queen and the flying bees (your artificial swarm).
The colony on the new site consists of one developing queen cell, eggs, larvae and nurse bees.

3.3 Collecting and hiving a swarm

Safety of the beekeeper is paramount.
Keep the public well away. There are usually some curious folk around.
Do not damage property (eg if bees are in a cavity wall) and get permission of the landowner if necessary.
The general rule is: collect the queen and the workers will follow.

Apart from your usual bee kit you will need:

- A box or skep to collect bees in
- A large cloth to wrap round skep for travelling later. A thin cotton or muslin is good for tying tight
- Ladder - maybe
- Secateurs /Saw
- Bee brush
- Smoker

Bees might be easy to collect, hanging from a low branch, or difficult – in a hedge or high up.
Shaking branches, smoking or brushing might be needed to move them into the receptacle.

Take your time, the objective is to get as much of the swarm as possible into a box/skep/nuc box which you then upturn on a cloth in the shade close to site of swarm.
Lift one edge of the box with a stone to allow an entrance. If the queen is in the box, the workers will follow.
Make arrangements as to where the bees will be moved to and make sure there is a hive ready to receive them.
Return to collect the swarm in the evening when the bees are all in the box and make safe for the journey by tying cloth tightly.
At the new site place an empty super above the brood box of your prepared hive and *block the entrance*.
Shake the bees into the super and they will slowly descend into the brood, attracted by the wax.
Shake and remove the super, replace the roof and open the entrance.
Feed after 3 days and inspect for disease.
Remember: If it is a prime swarm the queen will start laying eggs fairly pronto. If it is a caste you have a virgin queen and there will be a month before you see brood as she will have to mate first.

3.4 Signs of queenlessness and how to test if a colony is queenless

The main sign that there is no queen in the hive is an absence of eggs.
There is a particular tone of buzzing that you will get to recognise when the bees are queenless, this is called roaring.
The bees are often running about the combs restlessly.
If they have been queenless for a while they may be aggressive.
After 3-4 weeks without a queen the workers may begin to lay eggs (as these are unfertilised eggs you will see domed cappings and drones *in worker cells*).

To test whether a hive is queenless:
If see no eggs and suspect a queen is present, you can introduce some eggs from another colony. If your bees *are* queenless they will use one of the larvae on the introduced comb to raise a new queen. (If there is a queen in the hive, they will simply continue to raise worker bees).

3.5 Signs of laying workers and a drone laying queen.

Laying workers:
(*Multiple* eggs in worker cells, or worker cells which have domed cappings)
If a hive has no queen for 3-4 weeks workers may start laying eggs.
The workers have not mated so their eggs will all be drones – but these drones will be laid in worker comb.
They are also recognisable because workers will often lay several eggs in one cell and because of their shorter abdomens the eggs may be laid on the sides of the cells too.
As they develop it is clear they are not workers because the cells have high domes and are in irregular patterns.
The hive is therefore doomed, and the beekeeper must intervene and introduce a new queen.
Re-queening will only be successful if caught early.

Drone laying queen:
(Single eggs in worker cells which have high domes when capped).
The queen is present but laying unfertilised eggs.
This occurs when the queen has run out of sperm, therefore all eggs are unfertilised and will develop into drones.
The queen will unknowingly lay drone eggs in worker comb and will lay *one* egg in each cell as usual but these will have the high domed capping.
The beekeeper needs to replace this queen.

3.6 Simple method of Queen Introduction

Bees will not tolerate two queens in a hive so a new queen will only be accepted into a queenless colony.
It is generally easier to introduce a new queen into a small colony.
Bees seem to accept a new queen if she is a similar age to their old one.
It is best to delay the release of the queen, so bees have time to get used to her pheromones. This is done by putting new queen into a small cage (eg. Butler cage) made of a mesh which allows antennal contact and feeding by bees. The cage has an entrance blocked by fondant or paper which the bees will eat away, to release the queen later.
The cage is placed near the centre of the brood making sure the workers can access the entrance.
Inspect 2-3 days later to make sure queen has been released.

3.7 A method of uniting colonies

Firstly, check for disease in both colonies as you would only ever unite healthy ones.

If you want to unite two colonies, you must remove one of the queens first.
Bees recognise their own nest mates by their pheromones, so a good tactic is to slow down the merging of the two colonies. This is done by placing a single sheet of newspaper between the two brood boxes when you put them together, which the bees will chew through. -by which time the bees are used to each other's smell and the queenless colony are happy to accept a new queen. It does not seem to matter which brood box goes on top.

4. Disease and pests

4.1 The appearance of healthy brood, sealed and unsealed.

Firstly, it is important to be able to recognise when a colony is healthy:

The texture of the cappings should be dry and papery, a light biscuit colour, and worker cells should be slightly domed.
The larvae in open cells should be pearly white and curled up tight.
The queen should have laid in all the cells within an area, leaving a nice even brood pattern. This is most obvious when looking at capped brood which should have few empty cells.

4.2 Good Apiary hygiene

This refers to anything you can do to prevent spread of disease or contamination of honey.

- Personal kit: Gloves and hive tool should be cleaned in washing soda solution after each visit to an apiary, bee suit should be washed regularly.
- Beware of spreading disease when uniting colonies or moving combs/bees/eggs between hives.
- Replace old brood combs regularly to prevent build-up of pathogens.
- Keep newly gathered swarms in isolation for six weeks (two brood cycles) then check for disease.
- Try to put extracted supers back on the same hives they were removed from.
- Do all you can to prevent the start of robbing (See section 2.13).
- Premises and equipment relating to extracting must be spotless.
- Flame the inside of hive parts when equipment comes out of use, especially in autumn.
- Take care when buying second hand equipment and, again, flame before use.

4.3 Reasons for regular brood comb replacement

Change brood combs regularly to prevent a build-up of pathogens in the hive.

- Try to provide 3 or 4 new frames of foundation in a brood box each year (so that in four years you will have replaced them all). This is best achieved by moving old, black frames to the outside of the box in autumn. When you return in spring, they will be broodless allowing you to remove and replace them with foundation.
- Some beekeepers prefer to replace all the brood combs annually by performing a Bailey Frame Change in April. See diagram page 17.

4.4 Signs of BROOD disease

AFB

- Affects larvae AFTER the cell is capped.
- Cell cappings become sunken and may look greasy. Sometime the bees have chewed holes in them.
- 'Pepper pot' appearance to the sealed brood. (lots of empty cells).
- Do the Rope Test to confirm AFB: Dip a matchstick tip into the glue-like contents of an infected cell and the contents will stretch out into a mucus like thread for an inch or so. (this does not happen in EFB).
- An old comb will have hardened larval remains, lying along the bottom of the cells, which bees cannot remove (Hold comb up to the light to see them).

EFB

- Affects larvae in open cells.
- Larvae are not in their usual curled up position at the bottom of the cell. They look awkward, are halfway up the sides, loose their segmented definition and seem 'melted'.
- Dead larvae can be seen going yellow and brown and the brood looks patchy as the bees remove them.
- Some die after being capped but the cell contents will not 'rope'. (See AFB above).

Chalkbrood

- A fungus which kills the larvae after being capped.
- The larva goes hard and can appear grey or white and fluffy with fungal growth and are usually referred to as mummies.

- Dead larvae can be removed by the bees and may be seen on the floor of the hive.

Sacbrood.

- This virus kills the larva at the stage of the final moult.
- The bees often uncap the cell to show the larvae stretched out in the cell.
- It goes yellow then brown.
- The head curls up at the opening of the cell to give the 'Chinese slipper' appearance.

4.5 Describe methods of detecting and monitoring the presence of varroa and describe its effects on the colony, including awareness of the effects of associated viruses.

Monitoring of varroa lets you know if the mite population is building up or if a treatment is effective

- It is possible to see varroa mites on the bees' bodies. Chestnut coloured. Size of pinhead. Mites are related to spiders and therefore have eight legs. Crab shaped bodies with legs at the front.
- While monitoring we keep colonies on varroa floors with a tray underneath. Examine debris regularly and count the number of mites that have fallen. To find the daily mite drop divide the number of mites found by the number of days the tray has been collecting. Look at the NBU website for their Varroa calculator, enter the daily mite drop figure and follow their advice. (www.nationalbeeunit.com Enter 'varroa calculator' in the search box, click on Aug 2009 calculator).
- For the technique called brood uncapping you slide an uncapping fork under the domed cappings of mature drone brood. Lift out the pupae on the fork and you can see if there are mites on the white larvae bodies. You have a heavy infestation if 5-10% of the drone pupae are infested.

Effect of varroa on a colony:

- By puncturing and feeding on the bees' fat body tissue the varroa weakens both the larvae and adults.
- The length of the life of the bees is shortened which seriously affects nectar and pollen gathering.
- Bees are subjected to several viruses that are introduced by the varroa mites.

The types of viruses include:

- Deformed wing virus. Bees exhibit stumpy and deformed wings.
- Chronic Bee Paralysis Virus, (CBPV). Infected bees look black and shiny and are often shakey.

4.6 Aware of ADULT diseases acarine and nosema and their effects upon the colony

Acarine

- Acarine is a mite which lives in the trachea/breathing tubes of the bee and shortens the life of the adult bees affected.
- Hives affected do not build up well in spring. Bees may be crawling around on the grass in front of hive.
- Diagnosis is confirmed by using a low power microscope so the beekeeper will have to take a sample of bees for examination.
- Often associated with CBPV virus (see above).
- Bees may have K wing. Ie. Are unable to close their wings so they are constantly half open.
- Since we now treat hives for varroa mites acarine is rarely seen these days.

Nosema

- Nosema is a fungus which damages the digestive system and shortens the life of the bee.
- Colonies fail to build up normally in the spring.
- They also often have dysentery which shows up as yellow marks and streaking inside and on the outside of the hive. The dysentery contains millions of nosema spores and young house bees get infected when they try to clean up the hive.
- The beekeeper will have to take a sample of bees to make a slide of the contents of the abdomen to be examined under a high-power microscope to confirm diagnosis.
- A Bailey Frame Change is recommended. See page 17.
- Infected combs must be sterilised with 80% acetic acid.

4.7 Ways of controlling varroa using Integrated Pest Management (IPM)

The aim of IPM is to do all we can to keep pests below the level where they can do significant harm.

- Learn to recognise varroa mites.
- Keep strong colonies.
- Prevent robbing and drifting.
- Use open mesh floors.
- Dust bees with icing sugar regularly when you visit.

- April – July. You can use drone brood removal.
- Aug – Sept. Do a varroa treatment if required. eg Apiguard.
- Dec. Treat with oxalic acid.
- Treat swarms for varroa as soon as they are hived, as they will have no brood.
-

4.8 Current legislation regarding notifiable diseases and pests of honeybees

You would firstly make the hive entrances very small to prevent robbing. Do not move the hive.
You must immediately contact our Bee Disease Inspector if you find any of the following. See details below.

- **AFB.** See 4.4. If found bees are compulsorily destroyed.
- **EFB.** See 4.4. A heavy infestation would be destroyed.

There are two pests which are not yet in the UK but we are on the lookout for:

- **Small hive beetle.** A black/brown beetle which has club shaped antennae and is about the size of a bee's head. When the hive is opened, they head for the dark and clump in corners.
- **Tropilaelaps.** Very similar to, but smaller than, varroa. Instead of being crab shaped it has an oval body with four pairs of legs down the long sides.

If you see evidence of the Asian Hornet, (nest or adults) do not approach but you must give details to the Centre for Ecology and Hydrology. They are running the citizen science research project to locate the hornet nests.

- Asian Hornet. Smaller than our native European hornet. Has a dark brown body, yellow legs and a strong yellow stripe across their black abdomen. In spring small starter nests are usually low down and on or near buildings. Once the queen has successfully bred the first generation of workers the hornets will move high up in the trees to establish their main nest for the summer.

4.9 Who to contact regarding notifiable diseases and pests

- If AFB, EFB, Small Hive Beetle or Tropilaelaps are found you must contact our local bee Disease Inspector, Donald.mudie@apha.gov.uk 07443 255651
- For the Asian Hornet please notify alertnonative@ceh.ac.uk , preferably with a photo. They will need details of where Hornets were seen and your contact details.

4.10 How comb can be stored to prevent wax moth damage

There are two types of wax moth, Greater and Lesser.
Healthy hives can live with a few wax moths, but weak hives ones are vulnerable to being overcome.
Storing combs away from the hive (eg. in your garage) can attract moths so then there is nothing to stop the moth larvae munching their way through your comb making them very messy and unusable.
Moths are particularly attracted to stored brood comb due to the presence of extra protein as the bee larvae have shed their skins there while pupating. Greater wax moth also damage woodwork.

To store the bee free combs:

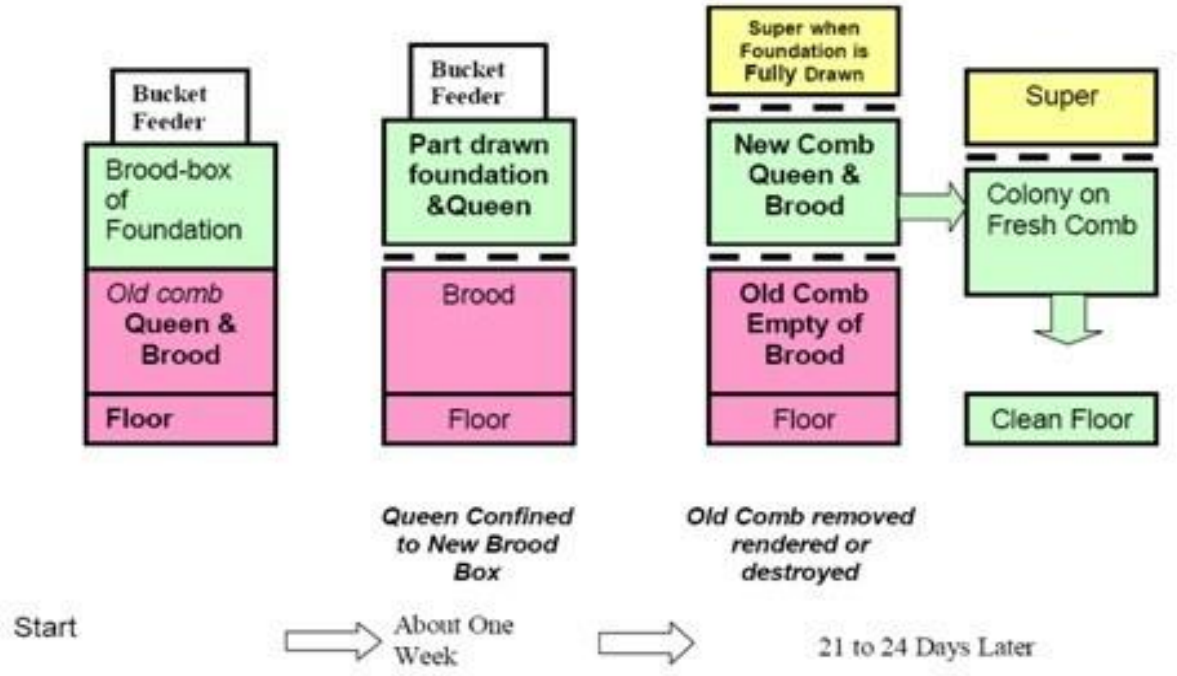
- You can spray the comb faces with Certain, (bacillus thuringiensis) a microbial insecticide which will kill the wax moth larvae, but which is harmless to bees.
- The fumes of acetic acid will kill adult wax moth and their eggs. Boxes of comb are stored with pads of 80% acetic acid between the boxes and sealed tight for one week. Note that the acid is corrosive and so you must remove metal spacers from the combs and do not place open boxes on concrete).
- Acetic acid will also disinfect combs affected by Chalkbrood and Nosema as it kills fungal spores.
- It is possible to freeze combs for 24 hours to kill wax moths, but this may not be practical.
- Make sure rats and mice can't access your stored combs.

4.11 Describe how mice and other pests can be excluded from hives in the winter.

- Mice can be a problem in winter. They will be looking for a warm place to hibernate and if there is food on hand so much the better- and a lot of damage ensues. Beekeepers place a mouse guard across the hive entrance in October to keep them out.
- Woodpeckers can be a pest. They will drill holes in the wood and eat larvae. Chicken wire or netting can be wrapped round the hive or strips of plastic hung round to flap in the wind and scare the birds.

Bailey Frame Change

A method of moving bees on to new comb without sacrificing eggs and brood.



The bees are gradually moved from the pink brood box to the green one.

1. Prepare a clean brood box filled with frames of foundation (Green)
2. Place this box over current brood box (Pink)
3. Feed with thick sugar syrup (1/2 litre of water to 1 kilogram of sugar), unless there is a strong nectar flow.
4. When the bees have drawn out some of the new foundation, find the queen and place her on this new comb.
5. Place one queen excluder over the old brood box and another over the new brood box, trapping the queen in the upper box.
6. If possible, arrange a new hive entrance between the two brood boxes and close off the old, thus helping to reduce the amount of pollen stored in the old lower combs.
7. After three weeks there will be no brood left in the old pink brood chamber, so you can remove it. Shake out any bees in front of the hive, they will find their way back in.
8. The old comb can be rendered to recover some clean beeswax.
9. Clean up wooden frames and put fresh foundation in.

Taken from www.talkingwithbees.com