MAKE SCIENCE PASSABLE

FIRST EDITION

LEARNER'S BOOK

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LET'S SHINE FOREVER

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AKNOWLEDGEMENT

Developing a book of this nature requires a lot of support from colleagues, Friends and family. I would like to register my deep-rooted gratitude to the following people for their unlimited assistance offered towards the completion of this book.

-Teacher **Tyan Grant Ignatius** of Child of Hope Junior School-Mbale,**Tr. Nalwanga Oliver** of Eastland Education Centre-Mbale and **Tr. Ariko Degrecious** of Nkokonjeru Primary School-Mbale and other teachers with whom I worked at various levels for their positive advice and critism.

-All authors whose books we used and consulted during our research for some of the materials in this book.

We do sincerely regret any mistakes which may be found anywhere in this book. It is not intended to be part of this book but accidental.

Author. Epidu Paul

PREFACE

Make Science Passable pupils' book five has been developed basing on the revised Primary five integrated science syllabus as prescribed by the new curriculum of the National Curriculum Development Center (NCDC)**.** The book contains accurate, relevant and current information covering all topics in all terms of the year in their order. It is intended to guide both teachers and learners.

The pupil's book caters for the interests in terms of simple and concise language used, Simplified content to cater for all learners with different abilities and clear illustrations to make learning enjoyable through observation. Key words for each topic have also been included in order to enrich the learner's vocabulary and mastery to ease understanding.

The topics have well organized, relevant and easy to understand notes and facts. It is written in a simple language and is well aided with illustrations/diagrams where necessary to ease understanding.

The book is remarkably precise but detailed in content with **no fact left hanging.**
it has been mainly written for primary Five in a language that is suitable for both rural and urban pupils. The book can therefore be used with minimum teacher guidance.

The book has inbuilt and continuous assessment activities at the end of sub topics. These questions are o help the learners to test their understanding of the concepts covered and are to enable the teachers to track progress as coverage goes on. This also makes the book convenient for individual and class learning by the pupils.

The activities are set basing on the three main levels of assessment at primary level that is to say: **Knowledge, Comprehension and Application**. The questions are carefully set in order to challenge the pupils in thinking, recalling, observing comprehending and applying knowledge and skills in day-to-day life. These tested skills are also key to excellent performance at PLE since it tests all the above levels.

Projects and experiments have been included to make the subject practical and to enable learners discover knowledge and facts by themselves. This is also to promote a positive attitude towards integrated science as a subject.

The book intend to provide learners with knowledge, skills and desired attitudes and values of basic science, health education, agriculture and the environment that are important to prepare learners for the final assessment of the primary level,
The book is written and developed by experience teachers of integrated science and we welcome all comments on the publication with an open mind for the improvement in the teaching and learning of integrated science. Comments and orders can be communicated directly through the following contacts: Call or Whatsapp: +256707986278/+256761119585

THEME 2: THE WORLD OF LIVING THINGS

TOPIC 2: BEE KEEPING

Terms used in bee keeping

(a) Apiculture

Is the rearing of honey bees.

Is the keeping and management of bees (refers to bee keeping)

(b) An apiarist

Is a bee farmer

(c) An apiary

Is a place where we find many bee hives.

Is a farm of bees / a collection of bee hives or a place where bees are kept.

(d) A colony

Is a large group of bees living and working together in a hive.

Is a group of bees living together.

(e) A swarm

A swarm is large group of bees moving in the same direction.

(f) Swarming

This is when part of the bee colony leaves the hive.

(g) A nuptial / maiden / wedding flight/Marriage flight

This is the flight during which a drone bee notes with a queen bee.

(h) Stocking the bee hive

Is the encouraging of bees to occupy an empty bee hive.

(i) Setting or setting a bee hive

Is the selecting of a suitable place in which to put a bee hive.

j). Absconding

Is when the whole colony leaves the hive in search of new hive

Is when the entire colony leaves the old hive.

k). Hiving:

Is the act of attracting bees to the hive using baits.

l) A hive:

Is a home of honey bees.

l). Baits:

Are things used to attract bees into the hive e.g. fruit juices, ripe bananas, cow dung etc.

m). **Brood**:

Are the young ones of bees.

n). Grub:

This is the larva stage

SOCIAL INSECTS

These are insects which move, live and work together in large groups.

Examples of social insects

- Honey bees
- Wasps
- Termites
- Red ants
- White ants
- Black ants
- Bumble bees

Examples of social bees

- Honey bees
- Bumble bees
- Stingless bees
- Carpenter bees

Solitary insects?

These are insects that do not live, move and work together.

Examples of solitary insects.

- Houseflies
- Mosquitoes
- Moths
- Cockroaches
- Tsetse flies
- Butterflies
- Grasshoppers
- Dragon flies

Solitary bees.

- Are bees that do not live, move and work together.

Examples of solitary bees.

- Mason bee
- Leaf cutter bee
- Mining bee (Digger bees)
- Plasterer bees
- Sweat bees

Types of honey bees / casts of honey bees.

- Queen bee
- Drone bee
- Worker bees

QUEEN BEE

- It is the master bee in a hive.
- Its main function is to lay eggs, it lays between 1000 – 2000 eggs per day and can live for four to five years.
- Its wings are shorter compared to its body.
- It is the largest in a bee hive and this makes it to be the leader in the hive.
- It has a longer abdomen
- It is a female bee.
- It lays eggs.
- It has an ovipositor for laying eggs.
- It feeds of a special food called royal jelly.
- It develops from the fertilized eggs.
- It mates once in her life time and stores the sperms in the sperm sac in the abdomen.

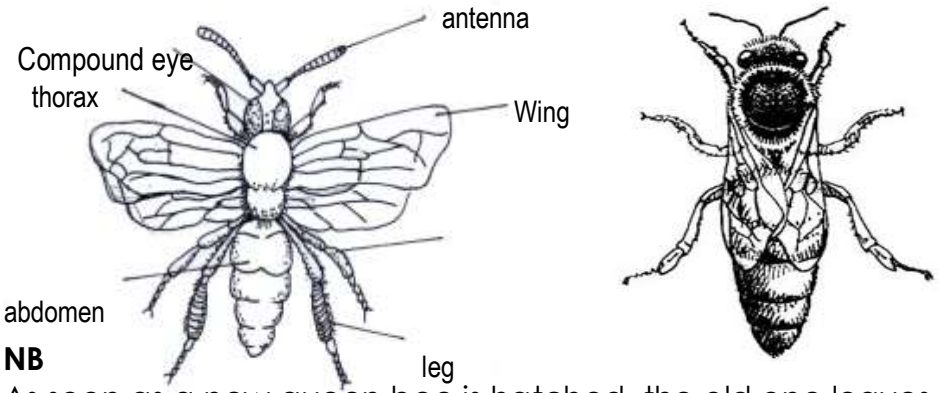
Role of a queen bee in the hive.

- To lay eggs

Importance of a sperm sac to a worker bee

- For storing sperms

Structure of a queen bee.



NB

As soon as a new queen bee is hatched, the old one leaves the hive. When the queen bee becomes old, it lay some fertilized eggs in big cells from which a new queen will develop.

DRONE BEES

- They are the male bees in a hive.
- Drones drove from unfertilized eggs.
- Drones do not have a sting.
- They make a buzzing sound while flying.

Role of drone bee in a hive.

To fertilize the eggs of a queen bee.

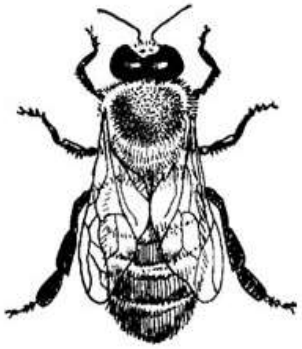
Reasons why a drone bee die shortly after mating with the queen?

- Due to damage on its lower abdomen which causes dehydration to death.
- Its reproductive organ raptures/tears which causes dehydration to death.

Reason why a drone bee is not often found in the hive

-it is because it is killed after mating with the queen and its body is removed from the hive.

Structure of a drone bee.



NB

The drone bee mates once in its life.

Its male organs break off during mating hence damaging the abdomen.

Qn. From which type of eggs do drone bees hatch.

Unfertilized eggs

WORKER BEES

- They are female sterile bees in a hive.
- They are the smallest in the hive.
- They have pollen basket on their hind legs
- They develop from the fertilized eggs.
- They do not have ovipositor.
- They have a sting.

Structure of a worker bee.

NB:
The worker bees loses its sting during stinging causing danger to its abdomen. This makes it dies soon after stinging the enemy.

Duties of worker bee.

- They are the smallest and busiest bees in the hive.
- They build and repair the hive.
- They collect pollen and propolis.
- They protect the hive.
- They feed the queen bee and the brood.
- They feed the grub.
- They defend the hive.
- They produce wax.
- They make honey.
- They look for a new hive in case of swarming.
- They have a sting used for defence.
- They regulate the temperature in the hive by flapping their wings.
- They have a pollen basket on their hind leg for carrying pollen.
- They are female sterile bees because their reproductive organs are under developed.

Diagram showing the hind leg of a worker bee

Pollen basket

Reason why worker bees are called female sterile bees?

They have under developed reproductive organs

Reason why a worker bee die after stinging a person?

- The loss of sting results in damaging of the bee's abdomen.
- The abdomen is damaged.

Ways in which worker bees control temperature in a hive?

By rapid flapping of their wings.

Food given to the queen bee by the worker bee.

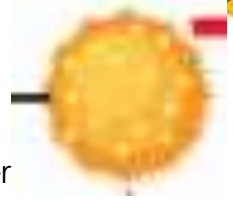
- Royal jelly

Things collected by bees from the environment.

- Nectar

- Propolis

- Pollen



- Water

Reason why worker bees collect water and nectar?

- For making honey.

Qn. What is propolis?

Propolis is a sticky substance collected from various trees.

Use of propolis to bees

- For repairing the hive.
- For smoothing the inside of the bee hive.
- Water proofs the hive.

Qn. What does a worker bee feed on

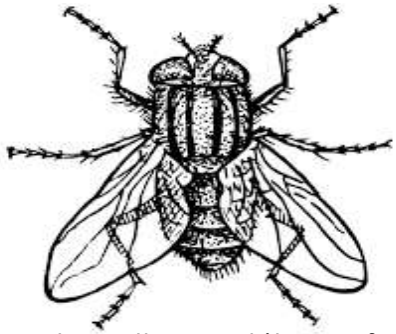
-worker bees feed on pollen.

Qn. Name the part of a worker bee that produces wax.

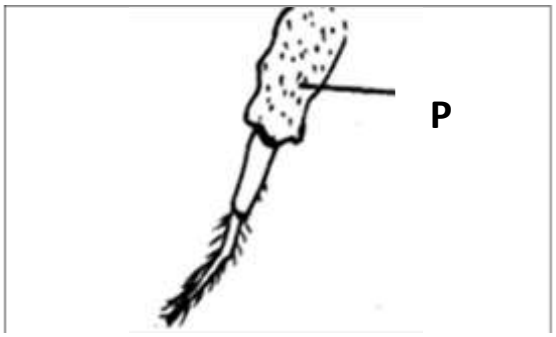
- Wax glands

Activity 12:

1. What is apiculture?
1 Why are honey bees considered as social insects?
2 Apart from honey bees, name any other examples of social insects.
3 What are solitary insects?
4 Which group of bees belong to solitary bees?
5 What is the largest organize group of bees living together called?
6 What type of food is given to the female larva of bees to become a queen?
7 State the use of propolis to bees.
8 Name the special food given to queen bees.
9 Identify any two types of bees without a sting.
10 Why does a drone bee mate once in its life?
11 Why is it no easy to be stung by the same worker bee twice or many times?
12 Why are grasshoppers called solitary insects?
13 Name the female sterile bees in the hive.
14 Why are worker bees sterile?
15 Why are drone bees not often found in the hive?
16 Give a reason why worker bees do not lay eggs.
17 Give two uses of propolis to bees.
18 **The diagram below shows an insect.**



By using letter **X** show the part it uses for hearing.
The diagram below shows the hind leg of a worker bee. Use it to answer questions that follow.



18. (a). Name the part marked P
(b). State the use of part P to a worker bee

a) Name any **two** types of bees.

b) Name the type of bees commonly seen around flowers.
c) How do bees protect themselves from enemies?

Importance of bees to people.

- People get honey from bees.
- People get bee wax from bees.
- Bees pollinate flowers.
- Source of income after selling their products.
- Bee keeping provides jobs.

Importance of bees to plants.

- Bees help in pollination of plants.
- Bees keeping encourages people to preserve trees.

Products got from bees.

- Honey
- Bee wax
- Pollen
- Propolis
- Bee venom

Reasons why bees collect pollen from flowers.

Bees collect pollen from flowers to feed the worker bees.

Importance of pollen collected by bees to man?

Pollen is eaten by man.

Uses of honey.

- Honey is used as medicine.
- Honey is eaten as food.
- Honey is used to sweeten bread.
- Honey is used to sweeten tea.
- Honey is a source of income when sold.

Food value obtained from eating honey

- Carbohydrates.
- Vitamins

Uses of bee wax

(i) Bee wax is used to make candle wax.
(ii) Bee wax is used to make shoe polish.

(iii) Bee wax is used to make floor polish.

(iv) Bee wax is used to make cosmetics.

(v) Bee wax is used to make ice cream.

(vi) Bee wax is used to make crayons.

Products obtained from bee wax

- Candle wax
- Shoe polish
- Floor polish
- Cosmetics

LIFE CYCLE OF A HONEY BEE

Qn. How do bees reproduce?

- By laying eggs.

Qn. Which type of life cycle do honey bees undergo?

- Complete life cycle.

Stages of development in which a honey bee undergo.

- Eggs
- Larva
- Pupa
- Adult

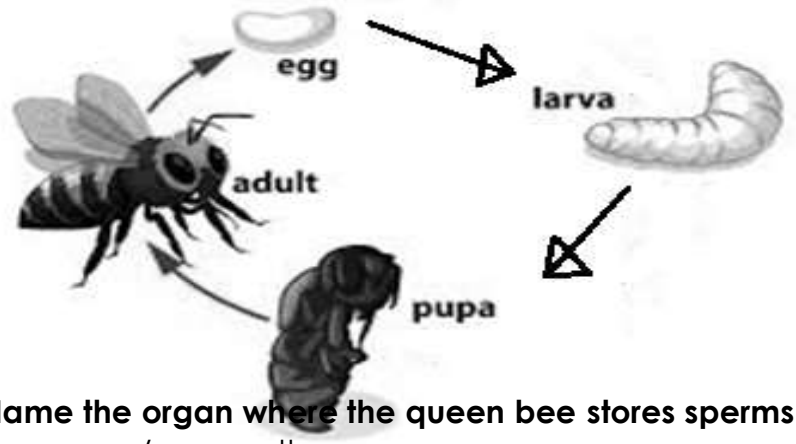
Qn.What name is given to the larva stage of a honey bee?

- Grub

The life history of bees

Honey bees undergo a complete metamorphosis. The larvae of honey bees is called Grub. The larvae feed on pollen and honey and the rest of bees apart from queen.

Illustration showing the life cycle of a honey bee.



Qn. Name the organ where the queen bee stores sperms.

- Sperm sac / spermatheca

Qn. Where does the queen bee lays their eggs

- The queen bee lays the eggs in the cells.

Qn. What name is given to the larvae stage of bees

- Grub.

Qn. Name the bee that feeds the larvae

- Worker bees

Qn. What does the larvae of bees develops into.

- The larvae develop into the pupa.

Qn. What does the pupa of bees develops into.

- The pupa develops into a young bee.

Qn. State what the grub is fed on.

-The grub is fed on honey.

FEEDING BEES

Although there should be flowers to feed bees, there are sometimes conditions that make the feeding of bees necessary. These are:-

- When they are new in a hive (new colonies)
- During the drought conditions.
- To encourage multiplication.

What are bees fed on?

-Ordinary sugar mixed with water to make syrup. Then this syrup is put in a container about 10m from the hive.

- Ordinary water put in the container at a distance of 10m from the hive.

Care and management of bees

- Providing shade to protect them from direct sunshine.
- Removing weeds which grow below the hive.
- Siting the hive in a noise free place.
- Providing bees with clean water and sugar in dry periods when there is no nectar to collect.
- Separate the honey chambers from one place to another.

Activity 13:

1 Name the largest bee in the colony.
2 State the use of an ovipositor to a queen bee.
3 What is the main duty of a drone bee in the colony?
4 How do worker bees regulate the temperature in the hive?
5 Identify any two materials collected by bees from plants.
6 State the main role of a queen bee.
7 Why does the queen bee have the larger abdomen?
8 Which type of eggs develops in to a queen bee?
9 What is the larvae bee called?
10 How useful are the worker bees to a crop farmer?
11 State any two uses of honey to people.
12 Mention any two products made from bee wax.
13 Name the smallest bee in the colony.
14 Why do bees collect pollen from flowers.
15 How important are the pollen collected by honey bees to man?
16 Name the food value obtained from eating honey.

SWARMING

This is when part of the bee colony leaves the hive.

Illustration showing bees swarming

Causes of swarming in bees.

- Bad smell in the bee hive.
- When the queen bee hive.
- When another queen is hatched.
- Shortage of flowers and water in a place.
- Overcrowding of bees in a hive.
- Attacks from their enemies.
- Bad smell around the hive.

Absconding

Is when the whole colony leaves the hive in search of new hive

Illustration showing bees absconding

Causes of Absconding

- Direct sunlight to the hive.
- Direct smoke into the hive.
- Too much noise around the bee hive.
- Leaking bee hive.

NB: 1. swarming is a form of reproduction. But when a colony absconds, the entire colony (or most of it) leaves and finds a new home—there is no increase in the total number of colonies. **Sometimes the bees leave in a large group that looks like a swarm**. At other times, the bees leave in smaller groups over a number of days.
2. Absconding occurs when a colony of bees leaves its home in search of another. It is not the same as swarming and it rarely happens in fall.
3. The portion of the colony that leaves the hive will contain the queen and about half of the workers from the original colony. **After leaving the hive, the**

bees will usually land nearby and form a cluster. It is this cluster that the casual observer often discovers as a swarm.

ENEMIES OF BEES

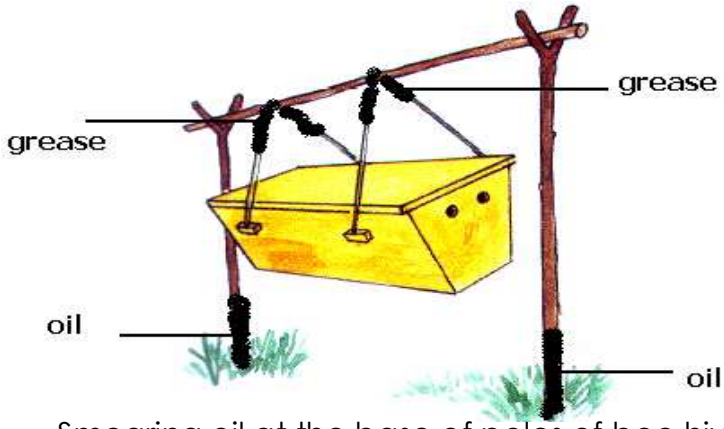
- Honey badgers - Safari ants
- Wax moths - Termites
- Hive beetles - Ants

ANTS

Examples of ants that attack bees:

- Wood ants.
- Sugar ants.
- Safari ants.

Ways of preventing and controlling bee enemies Protection of bees from ants



i) Smearing oil at the base of poles of bee hives.

(ii) Spraying using insecticides.

(iii) Spraying using insecticides.

(iv) Hang bee hives between two poles.

(v) Keep grass around bee hives short.

Diseases of bees

- Stone brood
- American foul brood
- European foul brood.
- Bald brood

TYPES OF BEEHIVES

(a) Traditional bee hives.
(b) Modern bee hive.

Traditional bee hives

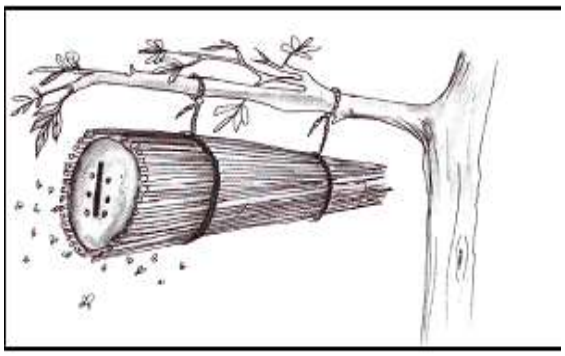
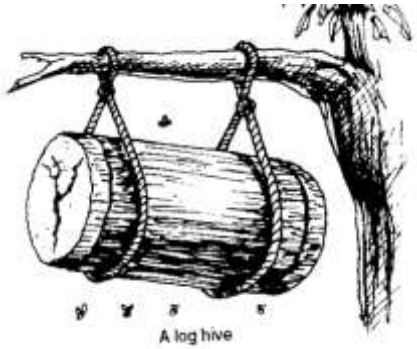
A **hive** is a home of bees.

Examples of traditional bee hives

(i) Kigezi bee hive

(ii) Dugout log hive.

Tin hive

	
Kigezi hive	Dug out log hive

Advantages of traditional bee hives.

(i) They are cheap and easy to make.

(ii) The colony is not disturbed by the bee keeper.

Disadvantages of a traditional hive.

(i) The colony cannot be inspired.

(ii) The hive is damaged in the process of harvesting honey.

(iii) The honey harvested is not always clean.

(iv) The hive does not last for long.

(v) It is not easily to inspect the colony.

MODERN BEE HIVES

Examples of modern bee hives

(a) Box hive
(b) Top bar hive

Parts of a modern bee hive

(a)Queen excluder

> It prevents the queen from going to the honey chamber.
> It separates the honey chamber from the brood chamber.
> It prevents the queen bee from laying eggs in the honey chamber
> It prevents the queen bee from eating honey.

(b) The holes

To allow worker bees pass through

(c) Honey chamber

It is where honey is stored.

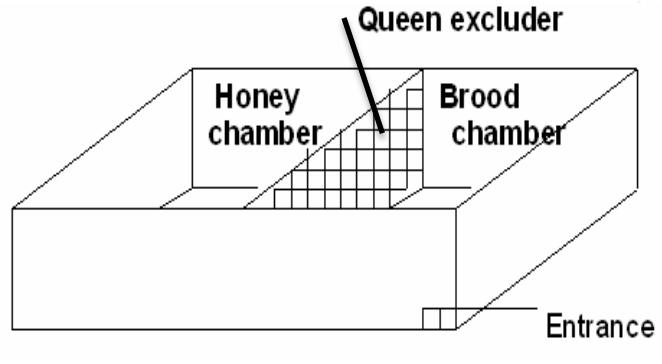
(d) Brood chamber

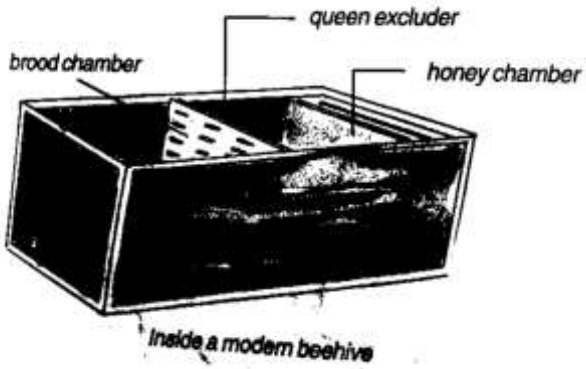
It is where the queen lays her eggs.

Reason Why an excluder is made of tiny holes?

To allow only the worker bees which have to prepare honey.

Inside a modern bee hive.





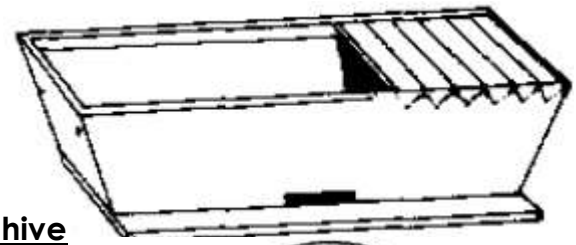
Things contained in a brood chamber

a. Eggs
b. Pupa
b. Larvae
c. Young bees.

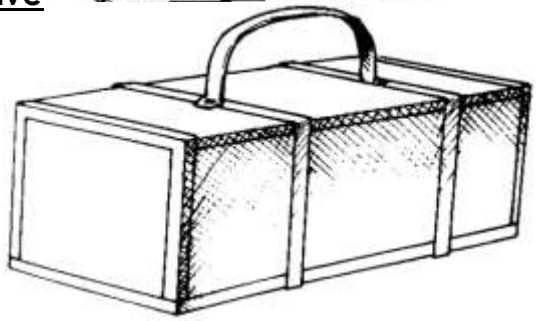
Reason why a queen excluder is made-up of small wire mesh

- In order not to allow the queen to pass through but only the worker bees.

A diagram of a top bar hive



Box hive



Advantages of a modern hive

- Clean honey is harvested.
- It is easy to inspect the colony.
- A modern bee hive lasts for a long time.
- A hive is not destroyed during honey harvested.
- The colony develops undisturbed.

Disadvantages of a modern hive.

- It is expensive to make.
- The colony is disturbed by the bee keeper.

Sitting the hive:

This is the selection of a suitable place in which to put bee hives.

Factors to consider when selecting a suitable place in which to put bee hives.

(i) The place should be free from noise.
(ii) The place should be away from the main road.
(iii) The place should be near flowering plants.
(iv) The place should be near a water source.
(v) The place should be far from people and animals.
(vi) The place should be sheltered from direct sunlight.

STOCKING THE HIVE

- Is encouraging bees to occupy an empty hive.

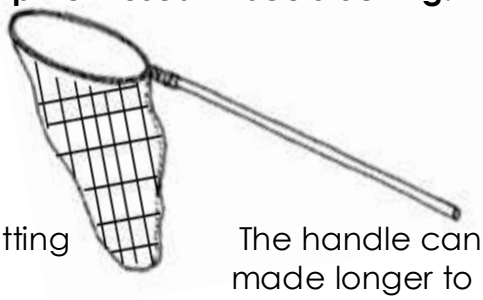
Ways of stocking a bee hive.

(i) By smearing bee wax in a hive.

(ii) By using a swarm catcher or catcher box.

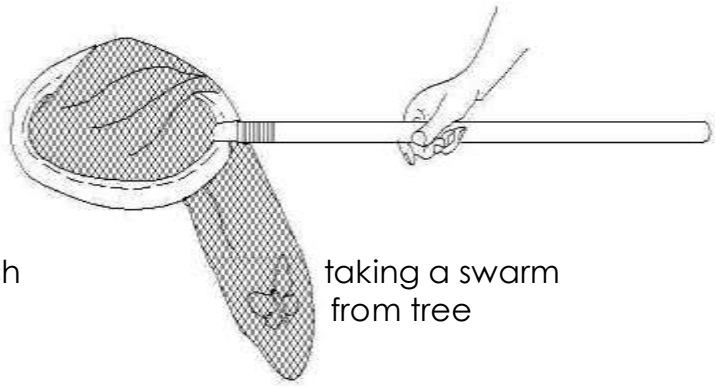
(iv) By using a swarm catching net

Equipment used in bee stocking.



Netting

The handle can be made longer to catch a higher swarm



taking a swarm from tree

a). Name the equipment in the diagram above.

A swarm catching net//Bee trapper/Swarm catcher.

b). Importance of the above equipment.

Used to trap hanging swarm and carry it to the hive

Activity in bee keeping which involves the use of the above equipment.

Stocking a hive// Bee stocking

Reason why the handle is made longer

To catch a higher swarm.

<u>Assessment Activity 14:</u>

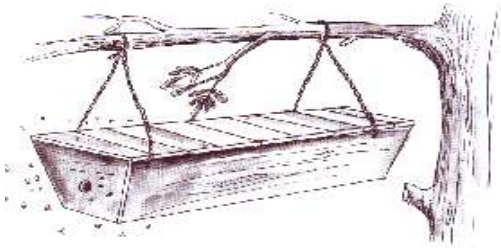
1. What is a hive?
2. State any three roles of worker bees.
3. Why don't worker bees lay eggs?
4. What can farmers do to care for their bees during the dry season?
5. Name the bee hive shown below.
6. How important are the following parts of a modern hive?
   (a). Honey chamber
   (c). Brood chamber
7. Identify any two materials from which traditional hives can be made.
8. Differentiates between swarming and absconding.
9. Mention any two reasons why bees:

a. swarm.

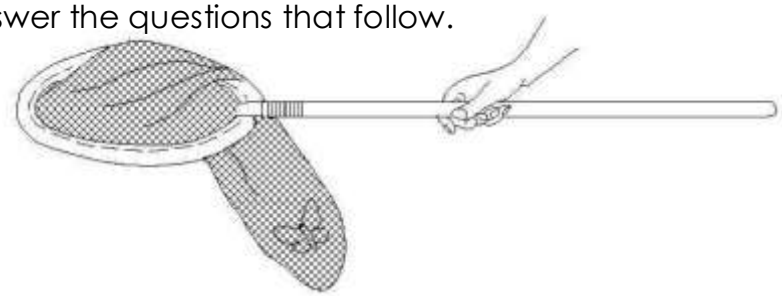
b. Abscond

10. Give any three enemies of bees.

11. Why is the excluder made of tiny holes?
12. What is the importance of a queen excluder in a top bar hive?
13. Name the modern bee hive shown below.



14. The diagram below is of an equipment used in bee keeping. Use it to answer the questions that follow.



(a) Name the equipment in the diagram above.
(b) How is the above equipment useful to a bee keeper?
(c) What activity in bee keeping involves the use of the above equipment?
(d) Why is the handle of the above made longer?

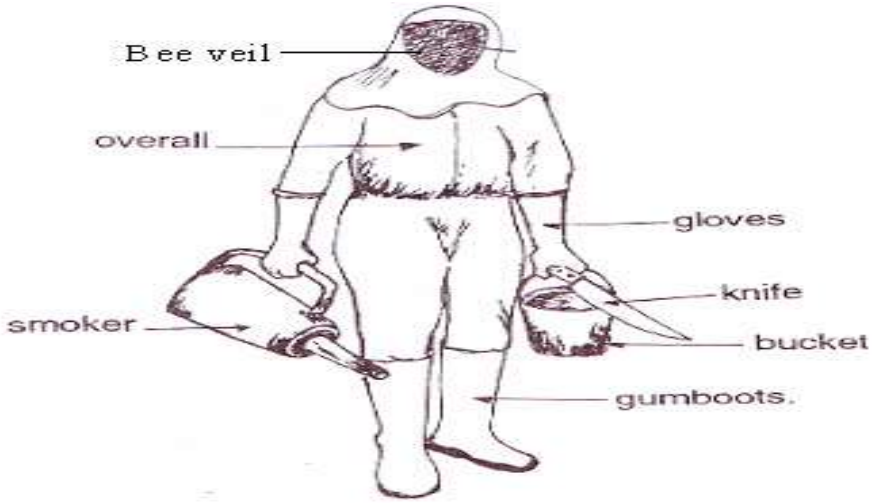
HARVESTING HONEY

is removing honey combs from the bee hive.

NB: - There three occasions when a bee keeper should handle bees namely:
- When harvesting honey.
- When inspecting the hive either to know whether he can harvest honey or there are problems.
- When catching bees or transferring them from one hive to another or when moving a hive.
- When handling bees, a bee keeper needs to protect himself. He needs the. following Equipment's.

- Bucket - bee veil
- Gumboot - gloves
- Smoker -Knife

Diagram showing a honey harvester



Function of each of the following equipment's when harvesting honey.

(a) Bucket

It is where harvested honey is put.

(b) Knife

For cutting honey combs from the hive.

(c) Overall

It protects the body of the honey harvester from bee stings.

(d) Bee veil

Protects the head of the honey harvester from bee stings.

(e) Gloves

Protects the hands of the honey harvester from bee stings.

(f) Gum boots

Protect the feet of the honey harvester from bee stings.

(g) Smoker

Produces smoke that calms bees in the hive.

For puffing smoke into the hive.

Steps taken during honey harvesting

- Puff smoke into the hive through the entrance.
- Lower the hive to the ground.
- Cut and remove honey combs from top to bottom.
- Place back the hive in the proper position.

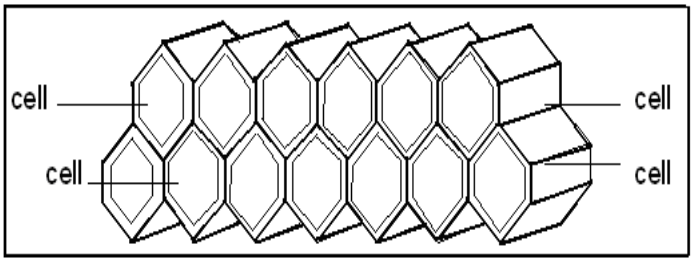
Rules for harvesting honey

- Only ready honey combs should be removed.
- Do not remove honey combs containing brood.
- Some honey combs should be left in the hive for the bees to feed before they build new ones.

Methods of harvesting honey

(a) Traditional method.
(b) Modern method

Honey combs



Importance of the above structure to worker bees

- Worker bees use the above structure to keep honey/ They are used to keep honey
- For storing honey.

Reason why harvesting of honey is best done in the evening?

All bees are in the hive and in active.

EXTRACTION OF HONEY

Extracting honey is the process of removing honey from the honey combs.

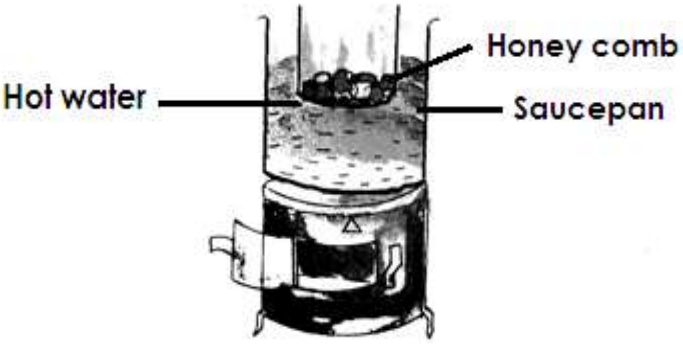
Methods of extracting honey

(a) Floating the wax method.
(b) Pressing the honey combs method.
(c) Centrifuging method

Floating the wax method

- Break the honey combs and put them in a large container.
- Put some water in a big sauce pan and place it on fire.
- Place the container with honey combs on a big saucepan with boiling water.
- The wax and honey will melt and wax will float on honey.

An illustration showing floating wax.



Pressing the honey combs method.

(i) The honey comb is placed on a piece of cloth.

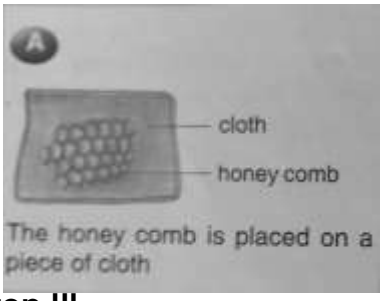
(ii) Honey combs are then wrapped in a clean piece of cloth.

(iii) Dip the wrapped honey combs in warm water.

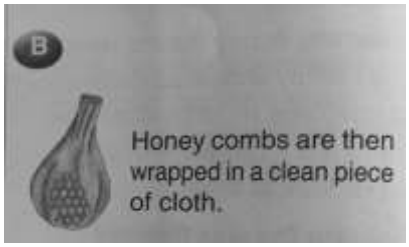
(iv) Squeeze the honey combs wrapped in a cloth to make honey come out.

Illustration showing steps for pressing the honey combs method.

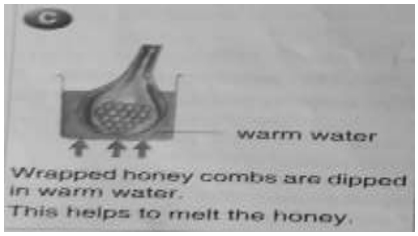
Step 1



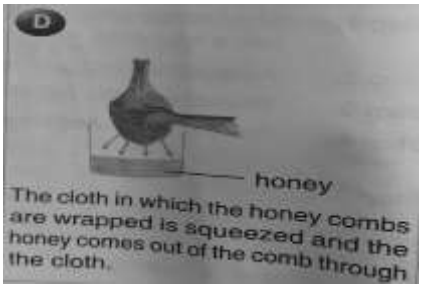
Step II



Step III



Step IV



Centrifuging method / spinning method

This is where a mechanic is used to extract honey from the honey combs.

Steps:

- Remove the wax that seals the comb and put the honey comb in the machine.
- The machine spins the honey combs round at a very high speed forcing honey to filter out.
- The honey then settles at the bottom of the machine.
- Boil the honey and store it a clean container.

A centrifugal honey extractor / machine.

Qn. State the importance of warm water during floating the honey method.

- To make wax and honey melt.

Qn.Why can't honey go bad?

- Honey has a lot of sugars and less water.
- Honey has very low water content for survival of germs.
- Honey is acidic in nature and cannot allow growth of germs.

Qn. What name is given to a machine used to extract honey from the honey combs?

- Centrifugal honey extractor.

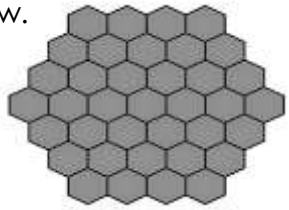
Bee farming as a business (Economic importance of bees)/uses/Reasons why bees are useful to farmers

- Source of income when sold.
- Source of employment.
- Bees pollinate crops or plants for easy fertilization.

- Bees are a source of honey which is used as human food and medicine.
- Source of bee wax used to make products like candles, Shoe polish, Cosmetics, Chewing gum and after shave.

Assessment Activity 15:

1. What is the difference between siting and stocking a hive.
2. Mention any two factors a farmer should consider during siting of the hive
3. Why do bee keepers smear wax or honey inside empty hives?
4. State one advantage of a modern hive over a traditional hive.
5. Why are there many farmers in Lalle village taking up bee keeping as a business?
6. Write down two examples of bee enemies.
7. How useful is a smoker during honey harvesting?
8. Write any three steps taken during honey harvesting.
9. Apart from a smoker, mention any other two equipment's of honey harvester.
10. What is incubation period for eggs of a duck?
11. Name three poultry vices.
12. Why is a broiler heavier than a layer of the same age?
13. How important are bees to: **(a),** People **(b).** Plants.
14. Mention any two factors considered by a farmer before starting a poultry farmer?
15. Why is honey harvesting done at night or evening time?
16. How important is a smoker during honey harvest?
17. Of what use is smoke during harvesting of honey?
    The diagram below shows the structure built by casts of honey bees. Use it to answer the questions that follow.



18. Name the casts of honey bees which built the above.
19. Name the structure shown above.

23. State the importance of the above structure to the bees named in number 19 above.
24. How is a worker bee able to keep the hive cool?

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- I have also helped children in this Schools and I am well equipped with REVISION QUESTION PAPERS and Simplified organized Notes for SCIENCE AND MATHEMATICS IN BOTH UPPER AND LOWERPRIMARY CLASSES Starting from P.1 to P.7
- This book gives basic and applicable skills to pupils that are useful in your daily life when approaching questions.
- The explanation are easy to understand and stimulate teachers' and pupil's interest.
- Learner's activities in this book form a strong foundation for learning SCIENECE

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- This book also designed to equip teachers' and help them prepare children for the upcoming Examinations.

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