

Name: _____
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NEP
2020

Specially Crafted For CBSE

Integrated
With
STEAM

Kinesthetic
Learning

SEED 'O' SEED

TEST WITH WATER

HOW LIGHT WORKS



**SCIENCE
ORIGINS**

With Real-World
Examples



Preface

Dear Young Scientists,

Welcome to the exciting world of science! I am Instyn, and I am thrilled to be a part of your first science book. Science is all around us, from the birds in the sky to the rocks on the ground. It's in the way the sun shines and the way the rain falls. It's in the way a seed grows into a beautiful flower, and the way a caterpillar turns into a butterfly.

You will also learn about traditional Indian practices based on science and how to take care of your body and the importance of cleanliness and hygiene.

You will be amazed to know that India has a rich history of science and technology. The ancient Indians were pioneers in fields such as mathematics, astronomy, medicine, and metallurgy. They had advanced knowledge of surgery, medicine, and metallurgy. Even today, the world continues to benefit from their contributions, such as the concept of zero in mathematics. It's astounding to see how ancient technology and science have been a source of inspiration for modern day science. Science is not just about learning facts; it's about using our curiosity and imagination to explore and understand the world around us. It's about asking questions like "Why is the sky blue?" and "How do plants grow?" and using our minds to figure out the answers. As you begin your journey into the world of science, I want to remind you that it's okay to make mistakes. That's how we learn and discover new things. So, don't be afraid to try new things and make mistakes, it's all part of the fun!

I hope you enjoy reading and exploring this book and I can't wait to see all the wonderful things you will discover.

Happy reading and exploring!

Instyn



Foreword

We have implemented a revolutionary approach to education by making school learning more applicable to real-world situations. Embracing the principles of The National Curriculum Framework (NCF), we have created a revolutionary new curriculum that will make learning in school as relevant as the world outside of it. Gone are the days of traditional, textbook-based learning - students are now at the forefront of their own education, actively participating in their own learning. This paradigm shift calls for a more malleable school system and a more focused approach to teaching, so that students can truly flourish.

We have created a powerful fusion of STEAM activities, cutting-edge technologies, and educational concepts to create an unparalleled learning experience. With the use of a comprehensive Learning Management System (LMS), each topic in this book is brought to life with interactive videos, manuals, DIY kits and assessments, ensuring that learning continues beyond the classroom. To ensure that no student falls behind, INSTYN has implemented a unique approach of "learning through play" that allows students to engage and interact with the material, making their academic journey more effective and enjoyable.

Prachi Singh
VP of Content

We would like to express our sincerest appreciation to each and every member of our content development and training committee for their invaluable contributions. We are deeply indebted to the institutions and organizations that have provided us with the privilege of utilizing their resources and materials. As an organization that is constantly striving for excellence, we welcome any feedback that will help us to enhance this version even further.



SEED 'O' SEED

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SEED 'O' SEED

Our Earth looks green because different kinds of plants cover it. Do you know how these plants grow on our Earth's surface?



It's Your Turn

Write the names of two fruits with:

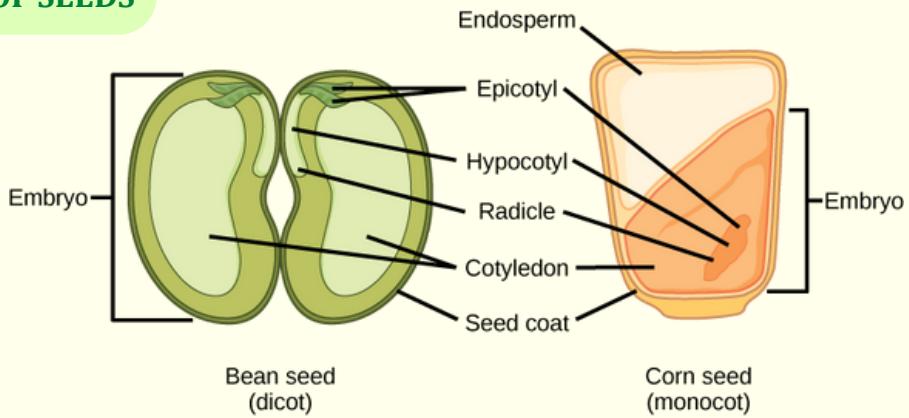
One seed _____

Few seeds _____

Many seeds _____

Seeds are responsible in most plants for the continuation of progeny. Seeds are special parts of the plant that are found inside the fruit of the plant. Seeds have a special structure called **cotyledon** that stores food inside them. This stored food is used by the plant when it is growing from the seed. A seed is made up of a **seed coat** and an **embryo**. The embryo is made up of a radicle, an embryonal axis and one (wheat, maize) or two cotyledons (gram and pea). A seed converts into a new plant when we sow it.

TYPES OF SEEDS



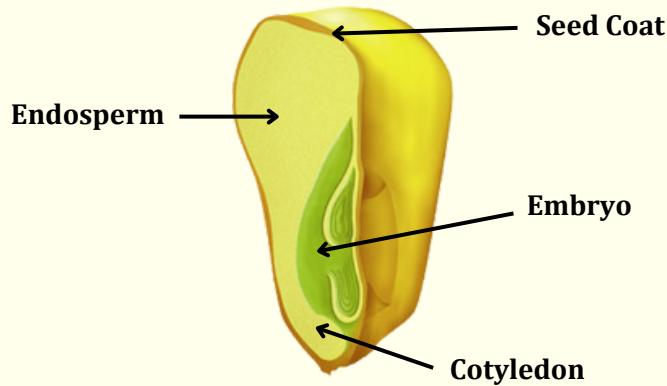
There are two types of seeds.

(1) **Monocot:** A monocot seed has only one cotyledon, that is, the seed is not divided into two parts.

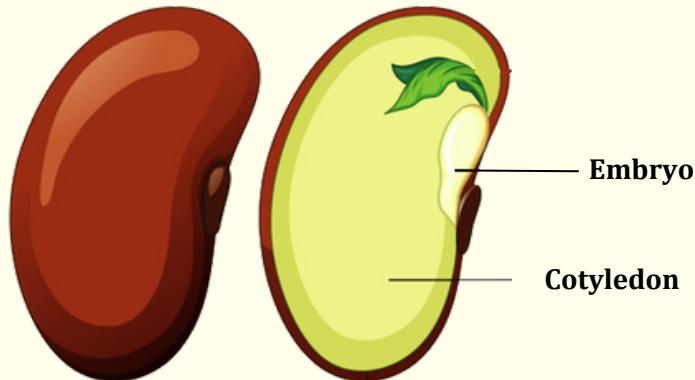
Example: Corn

(2) **Dicot:** A dicot has two cotyledons. The seed is divided into two parts.

Example: Beans



Monocot



Dicot

How long does a seed take to sprout and grow into a new plant?

Every type of plant takes different amounts of time to grow. Different seeds also take different amounts of time to sprout and grow.

Soaking and sprouting chart

Seed, Nut or Grain	Soak time	Sprout time
	8 hours	2-5 days
	8-12 hours	12 Hours
	6-8 hours	2 days
	8 hours	3-6 days
	6 hours	2 days
	4-6 hours	4-5 days
	7 hours	2-3 days
	8 hours	1 day
	2 hours	1 day
	4-6 hours	4-5 days
	8 hours	1-2 days
	2 hours	2-3 days

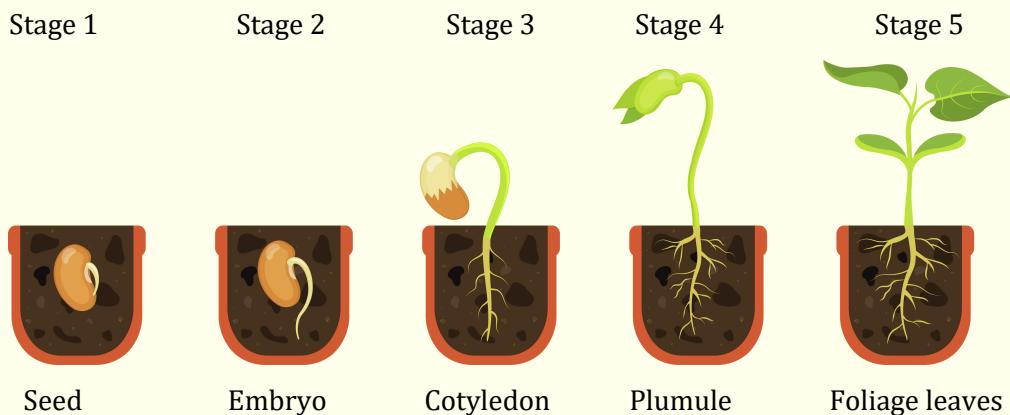
GERMINATION

The process of changing a seed into a seedling is called **germination**. Some plants like rice, mustard, beans and mangoes grow from seeds. Flowers are the reproductive organs of such plants. Flowers dry up and change into fruits. Fruits have seeds inside them. Seeds germinate and grow into new plants. All the seeds do not grow into new plants. Some seeds are used by human beings while some are eaten by birds or animals.

STAGES OF GERMINATION OF A SEED

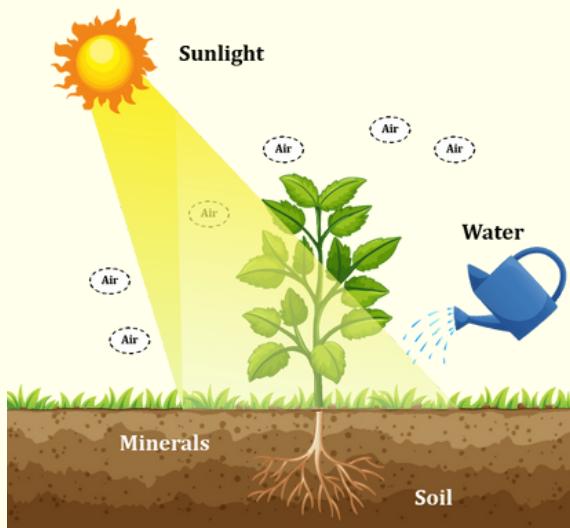
Seeing a tiny seedling come out from a dry wrinkled seed and watching its growth and transformation is an elaborate process.

- (1) The first sign of germination is the absorption of water and oxygen from the air. This stage is referred to as **Imbibition**.
- (2) This activates the seeds that begins the plant growth.
The seed starts to respire and store food. This is a lag phase of seed germination.
- (3) Soon the seed coat bursts open and a tiny root grows downwards whereas a shoot begins to grow upwards.
- (3) The shoot (plumule) develops and reaches towards the light while the root system develops deep in the soil.



NECESSARY CONDITIONS FOR A SEED TO SPROUT

A seed needs enough air, water, sunlight and nutrients to grow into a new plant. If any condition is missing, the seed will not grow into a new plant. Some seeds need special treatment or conditions of light, temperature, moisture, etc. to germinate.



Did You Know?



There exist fire-activated seeds that have a tough coating and needs fire or smoke to germinate. One such example is Eucalyptus plant.

DISPERSAL OF SEEDS

If all seeds fall and germinate close to one another, the seedlings will compete for space, water, light and nutrients.

That's why seeds spread out over large areas so that they do not grow near the plant. They will get all the conditions necessary for their germination.

The process by which seeds of plants spread too far off places from their parent plant is called **seed dispersal**.

Seeds can be dispersed in a several different ways. They may be carried by wind, water, animals and explosion.

MODES OF DISPERSAL OF SEEDS

Dispersal of Seeds by Wind

Some seeds are small and light in weight. They have special tufts of wings or hair present around them. These structures help them get blown away with the help of winds. Seeds like dandelion have tufts of hair that help them to float in air.



Did You Know?

Cotton fabric is made from the hair on the seeds. Each hair is 3,000 times as long as it is wide.

Activity Zone

Aim: To study the dispersal of seeds by wind.

Things we need: Dandelion flower, clock and table fan.

Method: (1) Keep the fan on the table and switch it on. Hold the dandelion flower in front of the blowing fan.
(2) Observe the seeds for one minute.



(3) What do you see?

You see that the seeds of the dandelion flower get detached and spread around the room.

(4) You get to know how seeds of some plants get dispersed with the help of wind.



It's Your Turn

Look at the given pictures of plants dispersed by wind. Complete their names.



C _ T T _ N



M _ P _ E



C _ E M _ _ I _



D _ N _ E L _ O N

Dispersal of Seeds by Water

Many aquatic plants that live near water have seeds that can float. They are carried by water. Plants living along streams and rivers have seeds that float downstream. Therefore, germination is possible at new sites. The size of the seed is not a factor in determining whether a seed can float. Some very large seeds like coconut can also float. The fruits of these plants are spongy.

A few seeds that spread with the help of water are coconut and lotus seeds.



Coconut seeds



Lotus seeds

Dispersal of Seeds by Animals

Animals disperse seeds in several ways. Humans and animals eat fleshy fruits and throw away their seeds in different places. Some fruits are eaten by animals and birds. The seeds, eaten along with the fruits are not digested. These animals excrete the seeds in different places. The seeds emerge into new plants.



Squirrel eating nuts



Black berries



Mimosa

Seeds of plants like xanthium, black berries and burdock have hook or spines. They stick to the hairy skin of animals or clothes of humans. They are carried away and deposited at a new site.



Burdock



Beggar Ticks



It's Your Turn

Which plant's leaves shrink when we touch it?

Dispersal of Seeds by Explosion

Some fruits scatter their seeds by exploding the seed pods. When the seeds are ripe and the pod has dried, it bursts open and the seeds are scattered.

For example, pods of **squirting cucumber** spread their seeds by explosion.

Pea and **bean** plants also keep their seeds in a pod. When the seeds are ripe and the pod has dried, the pod bursts open. The peas and beans are scattered.



Dispersal of seeds by explosion



A squirting cucumber

PLANTS THAT GROW WITHOUT SEEDS

There are some plants like the pineapple and the cucumber that do not produce seeds. They reproduce from their body parts like the root, stem or leaf. This type of reproduction is called **vegetative propagation**.

There are three types of vegetative propagation:

FROM STEMS

Potatoes, ginger, rose, sugar cane and money plant can grow from their stem cutting.



Potato plant

Plants like roses grow from stem cuttings. Cut the stem of the rose plant and bury it in the soil of another pot. Keep the pot under sunlight and water it regularly. After some days, the stem starts forming roots and sprouting new leaves. Potato, colocasia and ginger grow as underground stems. Buds are found on these plants at certain points, which grow into new plants under favourable conditions.



Did You Know?

The biggest seed – Coco-de-Mer, also known as the double coconut, grows only in the Seychelles. It weighs up to 30kg.

FROM ROOTS

Sweet potato, carrot and radish have modified roots that store food. They also have buds on them, which grow into a new plant when replanted.

Some roots plants like dahlia, guava and asparagus also reproduce by their roots. These roots give rise to new plants in favourable conditions.



Roots of sweet potato

FROM LEAVES

Leaves of some plants like podophyllum and begonia have many buds on their edges. These buds further grow into new plants in favourable conditions.



Podophyllum



Did You Know?

The Venus flytrap's jaws shut quickly enough to trap a fly, but only if at least two of its sensitive trigger hairs are touched. Other species, like the very large pitcher plant from Southeast Asia, may trap tiny creatures such as rats and reptiles by luring them with nectar or a special odour.



INSPIRATION FROM NATURE

George de Mestral, a Swiss engineer and enthusiast mountaineer, was trekking in the woods with his dog in 1948. When he returned home, he saw the burrs that adhered to his clothes and pondered if such a concept may be effective in commercial use. He examined a burr under a microscope and discovered that it was coated in tiny hooks that allowed it to grip onto garments and fur that brushed against it in passing. This leads to the discovery of **Velcro**.



Velcro Strip

(1) Look at the given pictures and write the names of plants to which they belong.



A __ L __



P _ A _ H



A _ R I _ O _



P _ U _

Types of seeds commonly used in agriculture.

The three types of seeds mostly used in agriculture are:

(a) **Grasses**: The cereals, wheat, barley, oats, maize, sorghum and rice, are all grasses. Their embryo has just one cotyledon or seed leaf. Hence, they are called monocotyledons. The embryo usually sits close to the surface of the seed and often is referred to as the "foetus".



Wheat



Maize



Rice

(2) Legumes: This group (Legumes) includes peas, the various beans such as french beans, chickpeas and lentils. The embryo is normally inside the seed and includes two seed leaves (cotyledons), so they are called dicotyledons. Their food storage is contained in the **cotyledons**.



Peas



Beans



Chickpeas

(3) Oilseeds: This group (Oilseeds) includes sunflower and soyabean. These are also dicotyledons, but their food storage contains much higher levels of oil than the legumes or grasses.



Sunflower Oil



Soyabean Oil

Functions of a seed:

- (a) Seed coat protects the baby plant.
- (b) Cotyledons provide food and nourishment to the germinating seedlings.
- (c) A baby plant living inside the seed, grows into a seedling.



It's Your Turn

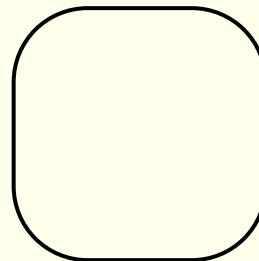
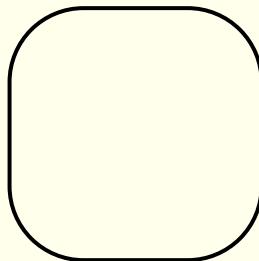
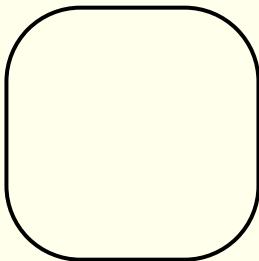
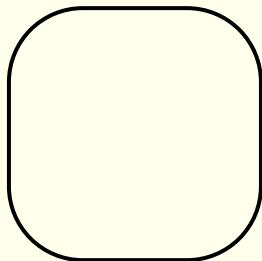
Are grasses dicot plants or monocot plants?

CLASS ASSIGNMENT

(A) Arrange the order of seed germination.

- (1) Seed coat breaks open and a root comes out.
- (2) When conditions are favourable water and oxygen are taken into the seed coat.
- (3) The seed is activated and it starts to breathe and grow a root.
- (4) Plumule starts showing up.

(B) Now draw the growth of a seed.



(C) Fill in the blanks with correct option.

- (1) The tiny plant that the seed coat protects is called the _____.
(embryo/cotyledon)
- (2) Seeds store food in the _____. (cotyledon/monocots)
- (3) _____ are plants that develop from single cotyledon seeds.
(Monocots/Dicots)
- (4) _____ are plants that develop from double cotyledon seeds.
(Monocots/Dicots)

Skill: Understanding germination of seed

(D) Can you guess this?

- (1) I carry and protect the seed. I am _____.
- (2) I carry water and minerals to other parts of the plant. I am _____.
- (3) I allow the plant to reproduce. I am _____.
- (4) I help the plant to produce seeds. I am _____.
- (5) I am made of the blade and the petiole. I am _____.
- (6) I take up nutrients and water. I am _____.

(E) Name the Two Methods of dispersal of seeds.

(F) Explain seed dispersal by Explosion.



DIY ACTIVITY



Watch the
instructions here.

CREATE YOUR OWN WINDOWSILL GARDEN



Objective

- (a) Create their own windowsill garden to grow a variety of herbs.
- (b) Explore how energy from the sun is used to grow plants.

Materials Required



Plastic Bottle



Scissors



Potting soil

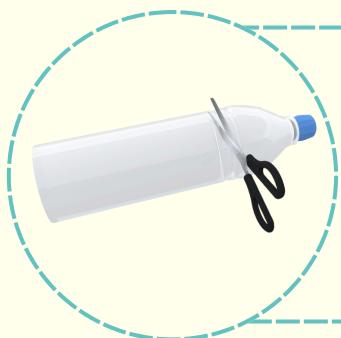


Variety of herb/spice seeds



Water spray bottle

Procedure

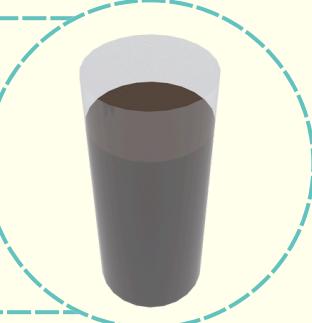


Carefully cut off the bottoms of the plastic bottle.

1

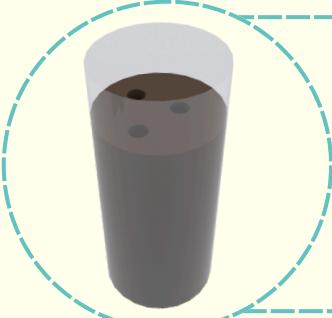
2

Fill the bottle bottoms about $\frac{3}{4}$ of the way with soil and pack the soil loosely.



3

Make 3 small holes with your finger in the soil.



4

Then place a seed in each hole and cover the seed with soil.





Add water to the soil using a spray bottle.

5

6 Place the jars on a south-facing windowsill that receives a lot of sunlight.



7 Water the herbs approximately every 2-3 days. Make sure the soil is moist but not soggy.

7

8 Harvest herbs after the plants have grown (few weeks).



Write your Observation



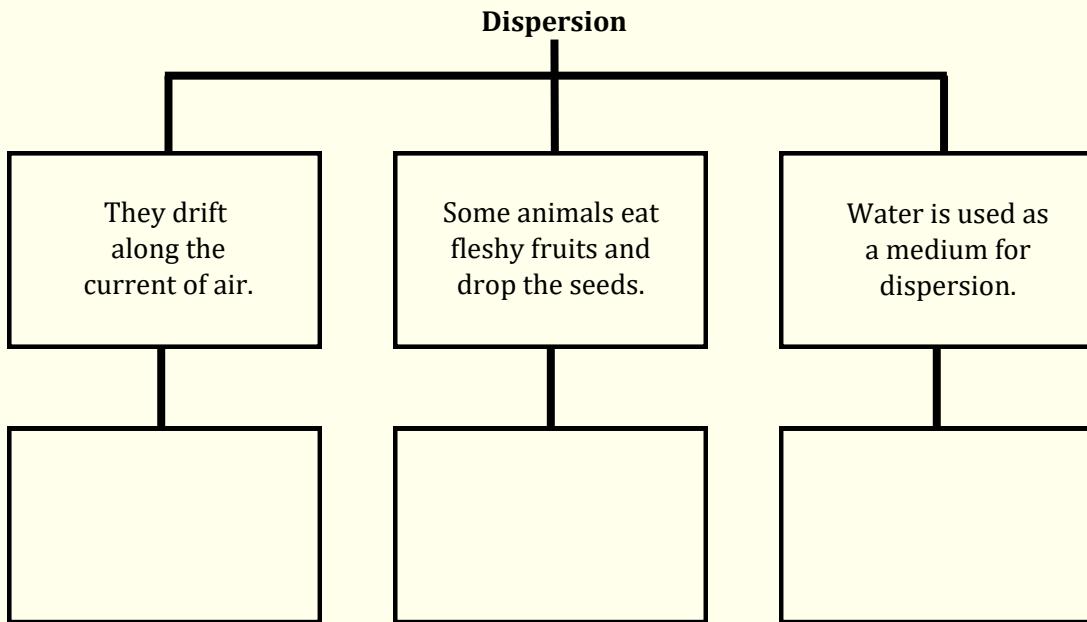
HOME ASSIGNMENT

Please scan the QR Code before proceeding.
This will help you to understand & revise the
concepts learnt in class.



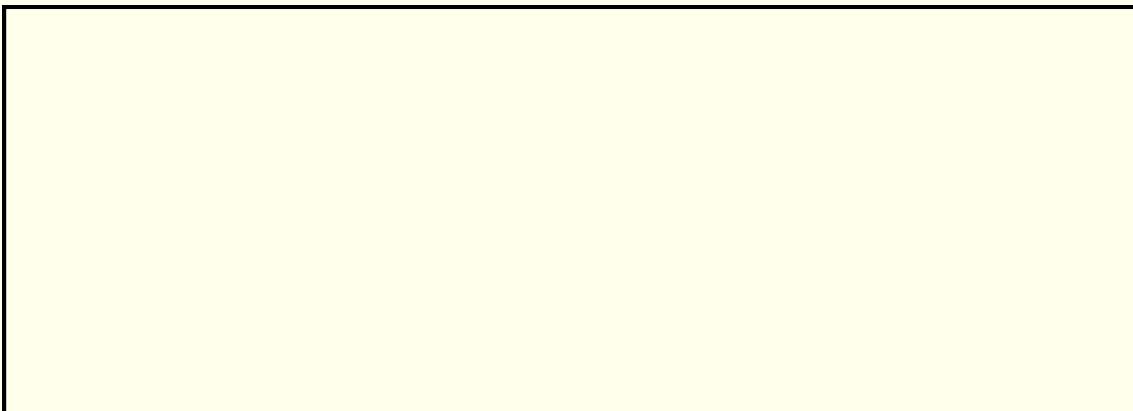
(A) Put a tick against all the correct statements with reference to germination.

- (1) Seeds need warmth, moisture and air to germinate.
- (2) Seeds of xanthium have hooks so they stick to the animal.
- (3) Inside the bean there is only one cotyledon.
- (4) Inside the bean there are two cotyledons.
- (5) These cotyledons contain stored plant food which is used by the baby plant.
- (6) Seeds are carried by wind, water and air.

(B) Name the types of dispersion in the boxes below

(C) Soak some bean seeds in the water and observe what happens after two days. Draw your observations.

(D) Soak some rajma seeds in the water. And observe what happens to the seeds after two days. Draw your observations.



Skill: Nutrition and plants

ASSESSMENT

(A) Tick (✓) and write the correct option.

- (1) The hard outer covering of a seed is called: []
(a) Seed coat (b) Seedling (c) Cotyledons
- (2) Which of the following plant seeds are dispersed by wind? []
(a) Coconut (b) Mimosa (c) Dandelion
- (3) Which of the following plant seeds have hooks on them? []
(a) Burdock (b) Lotus (c) Maple
- (4) Which plant reproduces from its roots? []
(a) Radish (b) Potato (c) Bryophyllum
- (5) Dandelions have tufts of hair that help them to float in []
(a) Air (b) Soil (c) Water

(B) Fill in the blanks.

- (1) A plant provides fruits that have _____ inside them.
- (2) _____ protects the baby plant.
- (3) Seeds that spread with the help of _____ are coconut and lotus seeds.
- (4) Some plants like _____ grow from stem cuttings.
- (5) The scattering of seeds to far-off places is called _____ of seeds.

(C) Write T for true and F for false statements.

- (1) All the seeds do not grow into new plants. []
- (2) Seedlings grow into baby plants. []
- (3) All seeds have wings or hairs present around them. []

(4) The plants that grow in or near water are dispersed by soil. []

(5) Potato and ginger are underground stems. []

(D) Give two examples of each of the following.

(1) Seeds dispersed by explosion.

(2) Seeds dispersed by animals.

(3) Plants that reproduce from stems.

(E) Answer the following questions.

(1) What are the different parts of a seed? Also write their functions.

(2) What is germination of a seed?

(3) What are the different ways of plant reproduction?

(4) What is dispersal of seeds? Name some agents by which seeds are dispersed.