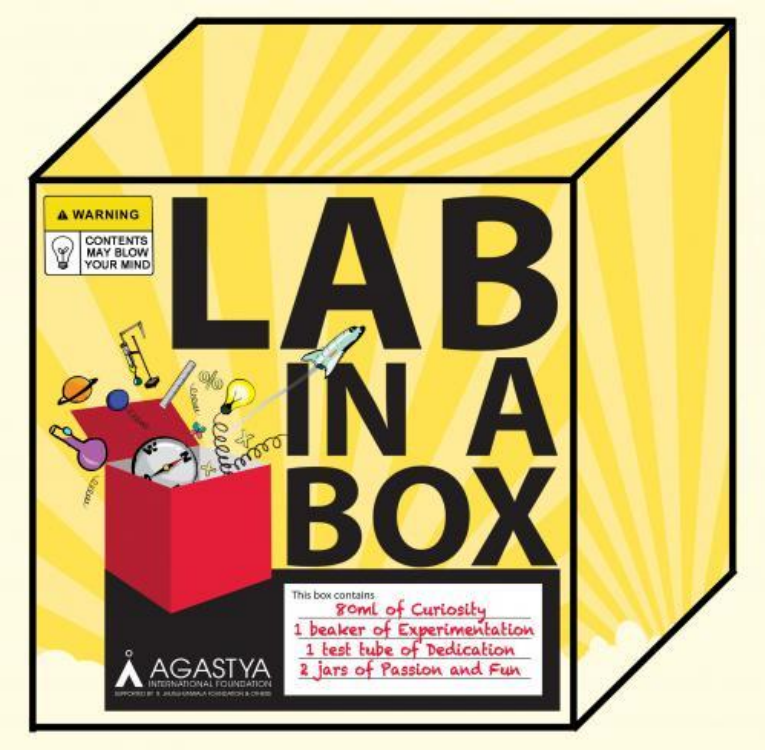
Lab in a Box 2

PLANT PHYSIOLOGY

&

ENVIRONMENTAL SCIENCES



Inventory

S.No	Materials	Quantity
	Glassware	
1.	Beakers (glass – 500 ml)	4
2.	Petridish	4
3.	Watch glass	2
4.	Boiling test tubes	4
5.	Slides	5
6.	Droppers	5
7.	Coverslips	1 box
	Equipment/Material	
8.	Spatula	3
9.	Knife	1
10.	Test tube rubber corks	4
11.	Test tube stand	1
12.	Measuring tape (tailors tape)	5
13.	Spirit lamp	1
14.	Mortar and pestle	1
15.	Magnifying lens	5
16.	Test tube holders	2
17.	Syringe	2
18.	Needle	4
19.	Measuring cylinder 50 ml	1
20.	Small plastic tray	1
	Chemicals and Reagents	
21.	Starch powder	100 gm
22.	Iodine solution	100 ml
23.	Potassium permanganate	100 gm
24.	Methylene blue	1
25.	Cresol red	1
26.	Benedicts reagent	1
27.	Copper sulphate	100 gm
28.	Sodium hydroxide	100 gm
29.	Spirit	1
	Charts	
30.	Germination of seed chart	1
31.	Food chain chart	1
	Activity sheets	
32.	Food chain	50
33.	Nutrient percentage cards	1 set
	Consumables	
34.	Incense sticks	1 packet
35.	Match box	1
36.	Naphthalene balls	1 packet

37.	Potato	2
38.	Carrot	2
39.	Cucumber	2
40.	Apple	2
41.	Salt	1 kg
42.	Sugar	½ kg
43.	Bell pins	1 packet
44.	Marker	1
45.	Cutters	3
46.	Dried grapes (kishmis)	50 gm
47.	Polythene covers	50 gm
48.	Vaseline	5
49.	Thread	5 rolls
50.	Paint brush small	1
51.	Blade	1 packet
52.	Different varieties of seeds (bean, maize, ragi)	50 gm each
53.	A4 Sheets	50
54.	Fevicol	5
55.	Scale	5
56.	Scissors	5
57.	Glucose	1 pack
58.	Sketch pens	1 packet
59.	Toor dhal	100 gm
60.	Rice grains	100 gm
61.	Wheat grains	100 gm
62.	Ground nuts	100 gm
63.	Dry coconut	4 pieces
64.	Tissue papers	1 roll
65.	Chart papers	10
66.	Straw	1 packet
67.	Hydrilla twigs	Few

Contents

1. DIFFUSION

Aim

To demonstrate the process of diffusion

Materials Required

Incense sticks, match box, beaker, potassium permanganate, spatula, naphthalene balls.

Procedure

Perform the following activities one by one.

Step 1

Light the incense stick and Place it at any one corner of the room and observe the smoke. Also feel the fragrance.

Step 2

Take 2 or 3 naphthalene balls and place it in another corner of the room. Feel the smell of naphthalene balls.

Step 3

Take a beaker and fill it with half of water. Drop a crystal of potassium permanganate in the beaker containing water. Observe the crystal dropped in the water.

Observation

In the incense stick, thickest smoke is at the lit end. Smoke moves away from the lit region and spreads across. As the smoke spreads, we can feel the fragrance.

The smell of naphthalene balls is felt at the other corner of the room.

Water becomes coloured slowly from the region where potassium permanganate crystal is dropped and after some time the pink colour spreads across water in the beaker.

Inference

The molecules of incense stick, naphthalene balls gradually spread across the room, similarly, the molecules of potassium permanganate gradually spread across water in the beaker. All these molecules move away from the region of high concentration towards the region of low concentration. This process is called diffusion, thus diffusion can be stated as movement of molecules from a region of high concentration towards a region of low concentration.

Diffusion happens in all kinds of matter, like gas in gas (as in case of incense stick) solid in gas (as in case of naphthalene balls), solid in liquid (as in case of $KMnO_4$ and water), liquid in gas (in case of perfumes), and liquid in liquid (in case of ink dropped into water).

2. OSMOSIS

Aim

To demonstrate the process of osmosis by potato osmoscope

Materials Required

Potato / carrot/Cucumber, sugar solution, water, beakers, petridish, sugar, bell pins and cutter

Procedure

Step 1

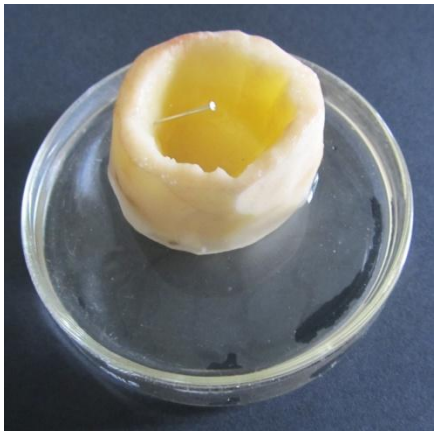
Peel off the outer skin of the potato/carrot/cucumber. Cut one end flat and make a cavity in the center of the potato/carrot/cucumber almost up to the bottom as shown in the picture.

Step 2

Place the potato/carrot/cucumber on its flat end in a petridish hall full of water.

Step 3

Fill half of the cavity of potato/carrot/cucumber with sugar solution and mark the level with help of the pin. This arrangement functions of osmoscope (or osmometer)



Step 4

Leave the potato/carrot/cucumber osmoscope undisturbed for about 1 hour and observe the level of sugar solution inside the cavity.

Step 5

If fast results are desired, put a spatula of sugar (dry) in the cavity and leave the set-up undisturbed. Within minutes, you can see the wetting of sugar.

Observation

There is an increase in the level of the sugar solution in the cavity of potato/carrot/cucumber.

Inference

The movement of water from the petridish occurs because of the difference in the concentration of water molecules (solvent) in the two regions, i.e. in the sugar solution in the cavity and water in the petridish. The cell membranes in the cells enclosing the potato/carrot/cucumber act as selectively permeable membrane for the movement of water, which is nothing but osmosis.

Osmosis is a special type of diffusion and can be defined as the movement of water molecules (or solvent molecules) from a region of its higher concentration to a region of its lower concentration through a semi-permeable membrane till a state of equilibrium is reached.

2.1 ENDOSMOSIS AND EXOSMOSIS

Aim

To demonstrate the process of endosmosis and exosmosis

Material Required

Dried grapes (kishmis), beakers, common salt (NaCl) and spatula.

Procedure

Step 1

Take two beakers and label them A and B.

Step 2

Fill the beaker A with half full of tap water and beaker B with half full of salt solution. (Dissolve 4 to 6 spatulas of salt in about 250 ml of water)

Step 3

Put 5 dried grapes in each of the beakers and leave it undisturbed for some time.

Observation

In the beaker A, the kishmis are swollen and in the beaker B the kishmis are shrunken.

Inference

Living cells are bounded by a selectively permeable membrane and thus show osmosis when placed in water or solutions having concentration lower than cell sap.

When a cell is placed in pure water, the water moves into the cell. This is called endosmosis. This can be seen as the cells get swollen. When a cell is placed in the solution of higher concentration than the cell sap, water moves out of the cell causing cells to shrink. This is called exosmosis.

3. TRANSPIRATION

Aim

To study the process of transpiration

Materials Required

Potted plant/garden plant, thin polythene bags, Vaseline, test tubes, test tube stand, syringe, thread and marker

Procedure

Step 1

Take four polythene covers and label them as A, B, C, and D with the marker, also take 4 test tube and mark them as A, B, C and D.

Step 2

Select a healthy plant in the field or a healthy potted plant and select any four healthy, fresh leaves of equal dimensions. (Do not select all the 4 leaves in the same branch, select one leaf in each branch)

Step 3

Apply Vaseline as per the following instructions

Leaf A: No Vaseline

Leaf B: Vaseline on the upper surface of the leaf

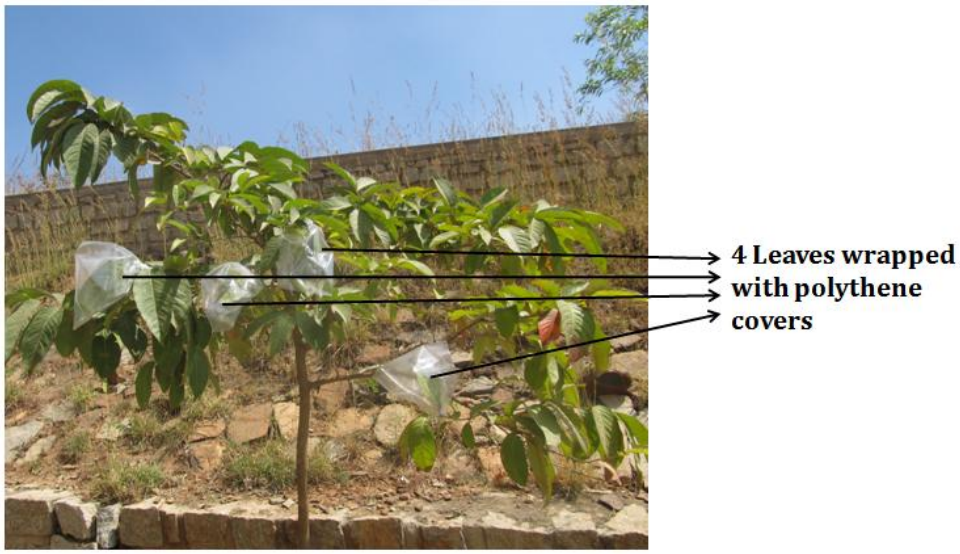
Leaf C: Vaseline on the lower surface of the leaf

Leaf D: Vaseline on both the surfaces

Step 4

Now, wrap the leaf with respective polythene bag and tie with thread at the free surface of the leaf stalk and leave it undisturbed for atleast 1 hour.

Make sure that there is no air gap.



Step 5

Water droplets will be accumulated in the polythene covers, with the help of syringe, transfer the water from polythene covers to the respective test tubes. Compare the water levels.

** An alternate experiment*

If sufficient plants are not available, pluck 4 healthy leaves of almost the same size from a tree and apply vaseline as per the above instructions and hang them in proper ventilation. Observe the leaves daily. Which leaf dries first? Which leaf remains fresh for longer time?

Observation

Leaf A has the maximum water droplets followed by leaf B and leaf C. Leaf D has no water droplets.

Inference

Water droplets are formed inside the polythene covers are due to the process called transpiration carried out by the leaves of the plant.

The removal of excess water from the leaves is called transpiration. Leaves have special openings called stomata, which regulate the transpiration. These stomata are more in the lower surface than in the upper surface. On applying Vaseline, these stomata get blocked.

In the experiment, Leaf A has released maximum water droplets as it is not covered with vaseline, all the stomata are open. No water droplets are seen in Leaf D as stomata on the both the surfaces are blocked. Leaf B (where Vaseline applied on the upper surface) has more water droplets than leaf C (where vaseline applied on the lower surface) because stomata are more in number on the lower surface of the leaf than the upper surface.

3.1 OBSERVING STOMATA IN A LEAF

Aim

To observe the stomata in a leaf

Material Required

Fresh leaf of any thin dicot leaf fresh enough to slice (e.g. Hibiscus, Four clock plant), needle, blade, methylene blue, slide, cover slip, watch glass, brush and microscope.

(Microscope to be taken from Box 1)

Procedure

Step 1

Take a fresh leaf of rheo plant, cut out a portion of leaf.

Step 2

Take out the peel from the cut portion and transfer it to the watch glass containing water.

Peels can be taken out by tearing the leaf obliquely with a single jerk or scrapping with blade.

Step 3

Add two drops of methylene blue to each watch glass containing peel.

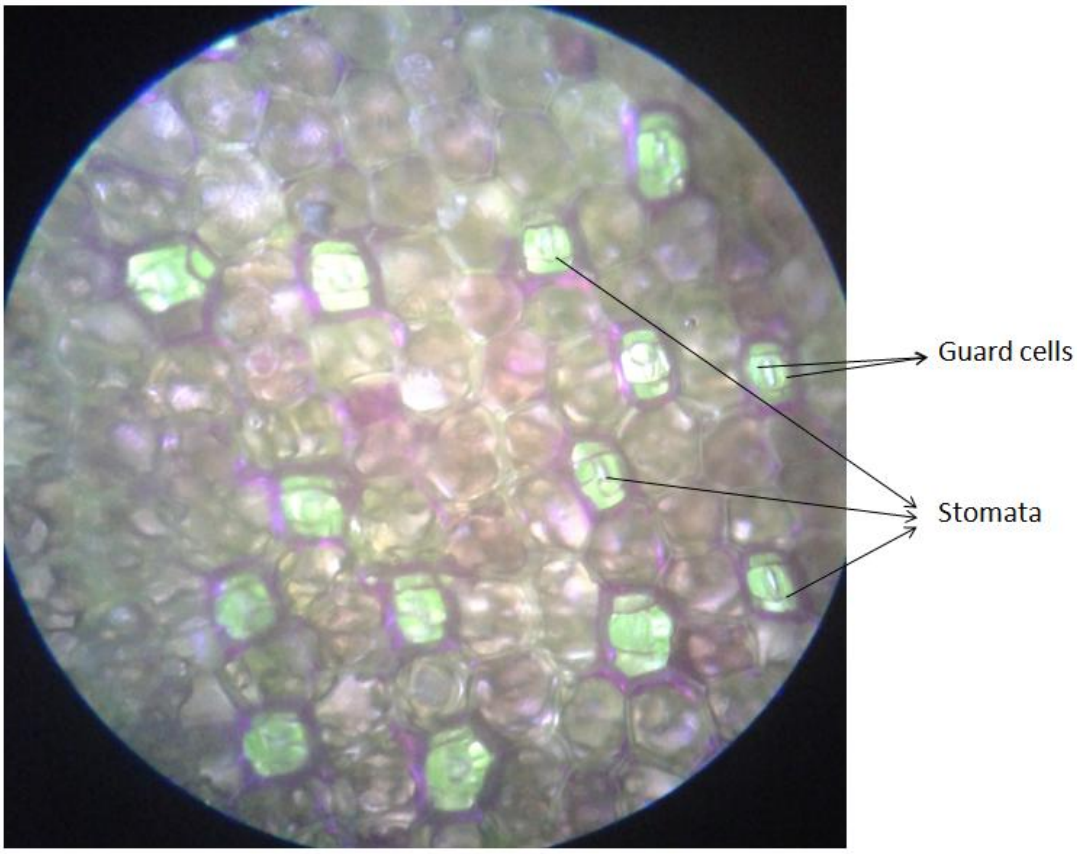
Step 4

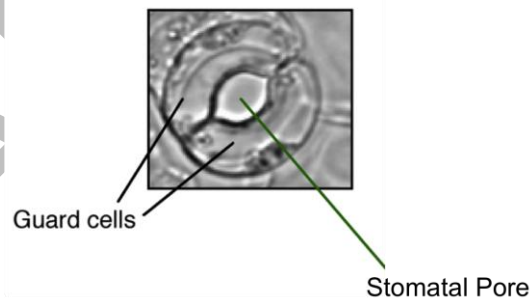
Transfer the peel to a slide and observe under microscope.

Step 5

Cover the peel with coverslip and observe under microscope.

Observation





Inference

Stomata are the microscopic pores present in the epidermis of the leaf. Stoma helps in exchange of gases and in transpiration. Each stomata has a slit like opening called stomatal pore, which is surrounded by two special kidney shaped cells called guard cells.

4. PHOTOSYNTHESIS

Aim

To demonstrate the process of photosynthesis by absorption of carbon dioxide

Materials Required

Test tubes, test tube rubber corks, cresol red solution, hydrilla plants, straw, beaker and water.

Procedure

Step 1

Prepare the cresol red solution by adding 10 ml of cresol red in 300 ml of water taken in beaker.

Step 2

With the help of straw, slowly blow air into the cresol red solution in beaker. On continuous blowing the cresol red solution turns to yellow colour.

Cresol red solution

Blowing air (CO_2)

Solution turned to yellow colour

Step 3

Take two test tubes and label them as 1 and 2.

Step 4

Quickly fill both the test tubes half way with the cresol red solution (yellow coloured) and add equal amounts of hydrilla twigs to both the test tubes and seal them rubber corks.

Step 5

Keep test tube 1 in the bright sunlight and test tube 2 in the dark (cupboard, or box). Leave them undisturbed for 30 minutes, and then observe the colour change.

Test tubes with cresol red solution (yellow) and Hydrilla

Test tube 1 kept in sunlight showing pink colour

Test tube 2 kept in dark showing same yellow colour

Observation

The solution in the test tube 1 turns to pink colour and the solution in the test tube 2 remains yellow.

Inference

Photosynthesis is a process by which green plants make their own food from carbon dioxide and water by using sunlight and chlorophyll.

Cresol red is a pale pink coloured indicator which turns to yellow colour on acidic conditions (high carbon dioxide levels). Thus on blowing air, the cresol red

solution turns to yellow, which means that it has high amounts of carbon dioxide and acidic in nature.

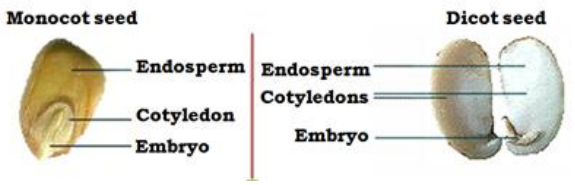
When hydrilla twigs are introduced into this solution and kept in sunlight (test tube 1), hydrilla leaves perform photosynthesis, for which carbon dioxide is absorbed. This considerably brings down the acidic levels in the solution resulting in the turning of solution from yellow to purple/dark.

In the test tube 2, which is kept in dark, no photosynthesis takes place and no carbon dioxide is absorbed by the hydrilla twigs (in fact, through respiration hydrilla itself release CO_2) hence the solution remains yellow.

5. STRUCTURE OF SEEDS

Aim

To study the structure of seed



Materials Required

Different varieties of seeds like bean seed, maize seed, ragi seeds, papaya seeds etc

Procedure

Step 1

Soak the seeds in the water for overnight, allow the seeds to swell.

(Soak the seeds one day before and keep it ready during the actual class)

Step 2

Gently cut open the seeds and discuss the following.

Structure of the seed

Seeds of different plants vary in size and shape but their basic structure is similar

A mature seed consists of two basic parts

1. **The seed coat:** The seed coat is the outer protective covering of the seed.
2. **The embryo (baby plant):** The embryo is the young/miniature form of plant enclosed within the seed coat. Embryo consists of
   a) A young shoot called plumule
   b) A young root called radical
   c) One or two seed leaves called cotyledons

   Depending on the number of cotyledons, the plants are categorized as monocotyledonous (monocots) and dicotyledonous (dicots). As the name suggests, one cotyledon is present in monocots (maize, rice) and two cotyledons are present in dicots (bean, sunflower)

   Depending on the plant, the food for the embryo is stored either inside the cotyledons or in special cells called endosperm surrounding the embryo.

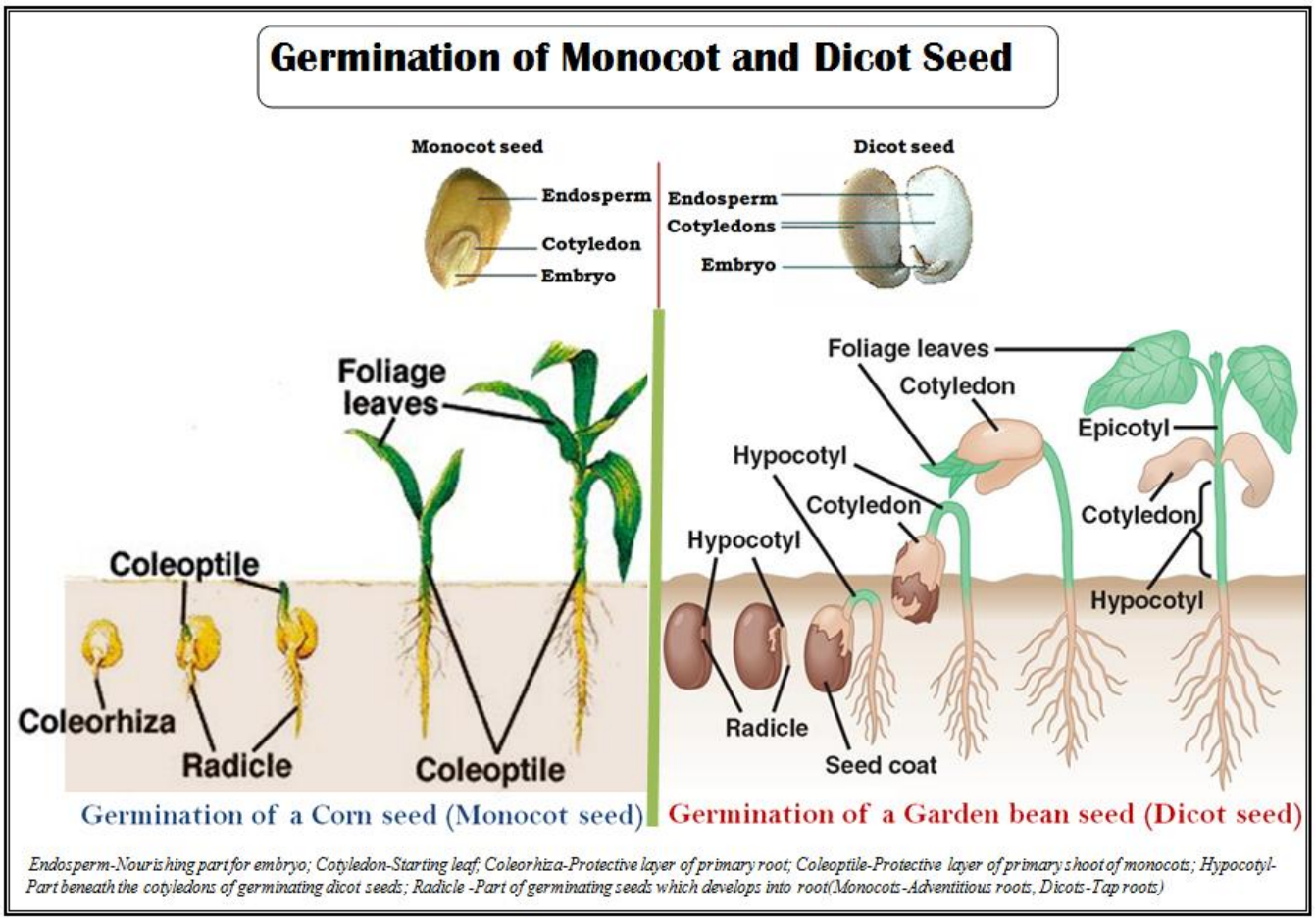
5.1 GERMINATION OF SEED

Aim

To study the process of seed germination

Materials Required

Germination of seed chart



Procedure

Explain the following using the germination of seed chart.

The process by which embryo becomes active and grows into a young plant is called germination. Water, oxygen and favorable temperature (25^0 C to 35^0 C) are necessary for germination.

Types of Germination

There are two main types of germination, namely and Hypogeal germination Epigeal germination.

Hypogeal germination – In this mode of germination, the cotyledon remain below the coil. It is seen in maize, pea (dicot seed)

Germination of Maize seed (Monocot)

1. The seed absorbs water and swells.
2. The radical comes out of the seed and forms the primary root.
3. The plumule comes out forming the leaves
4. The food stored in the endosperm is utilized for growth.
5. The cotyledon remains below the ground.

Epigeal Germination – In this type of germinations, the cotyledons are pushed above the soil. This model of germination is seen in most of the dicot seeds.

Germination of Bean seed (Dicot)

1. In bean seeds, germination starts with uptake of water, as result, seed coat burst and radical comes out. Radical grows downwards
2. This is followed by the elongation of plumule and the seed comes out of the soil. The plumule emerges between two cotyledons and forms two leaves.
3. The food stored in the cotyledons is used for growth and finally cotyledons shrivel and fall off.
4. The radical gives rise to root system and plumule forms the shoot.

6. ECOSYSTEM

Aim

To study the structure of ecosystem (near the school/home)

Material Required

Measuring tape, chalk, magnifying lens, thread, paper and pen

Procedure

Step 1

Divide the class into 4 or 5 groups and ask the groups to select an area in the field near by the school. The field can be on grass, side walk area, cultivation land, barren land etc

Step 2

Using measuring tape, measure a square area of about 2 meters long and 2 meters wide

Step 3

Mark the edges/borders of the selected area with help of chalk or thread.

Step 4

Observe the marked area carefully. Look for plants, animals, things, objects etc present in the marked area. Use magnifying lens for this purpose.

Step 5

Record all the things (both living and non living) which you observed in the area.

Observation

S.No	Living things	Non living things
1		
2		

3		
4		
5		

- ☞ What living things did you find?
- ☞ Which kind of living thing is most common in the study area?
- ☞ Other than the living things what other things you recorded?
- ☞ How do these interact with each other?

Inference

Ecosystems are made up of groups of living things and their environments (called as habitats). The living things like plants, animals, micro organisms are known as biotic components of ecosystem, where as others like soil, water, rocks, stones, sunlight etc are called abiotic components of the ecosystem. All these organisms live together and interact with one another in many ways.

6.1 FOOD CHAIN

Aim

To study food chain

Materials required

Food chain paper activity sheet, scale, scissors and fevicol

Procedure

Step 1

Using the scissors cut the outer excess part of the activity sheet.

Step 2

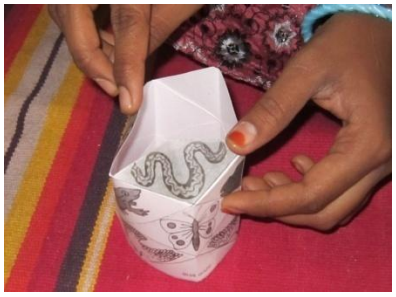
With the help of scale fold the diagonal lines first and then the straight lines as shown.

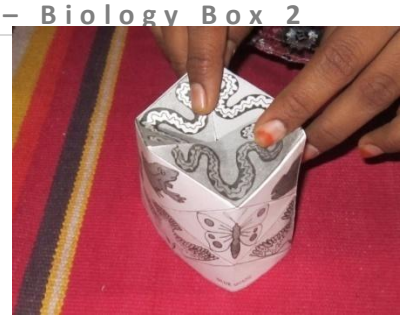
Step 3

Bring the paper's left and right sides together and paste using fevicol. Thereby making a three dimensional prism.

Step 4

Push in the three triangular areas at the top of each other.



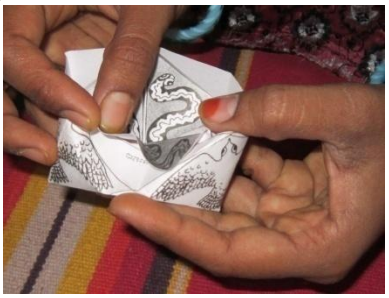


Step 5

Press all the three top points down and through the centre. The next row of triangles will assume a similar shape.

Step 6

Once again, press all three top points down and through the centre.



Step 7

Turn the model over and push in the three triangular areas at the top of each other.

Step 8

This will complete the flexagon. To make it rotate hold it on either side or twist the outer edges in towards the centre, so that the inner surfaces appear.

Observation

Every time when you rotate the flexagon you observe the food chain as

Insects are eaten by the frogs, which are eaten by the snakes – which in turn are eaten by eagles.

Inference

All organisms in an ecosystem derive energy from the food to live. The sun is the main source of energy for all living things. Plants trap this energy through photosynthesis and make food. Animals do not get energy directly. Many animals eat plants, however, which use sunlight to make food. Animals that do not eat plants still depend on the energy of sunlight as they eat other plant eaters. Thus energy moves in the ecosystem, which we call as food chain.

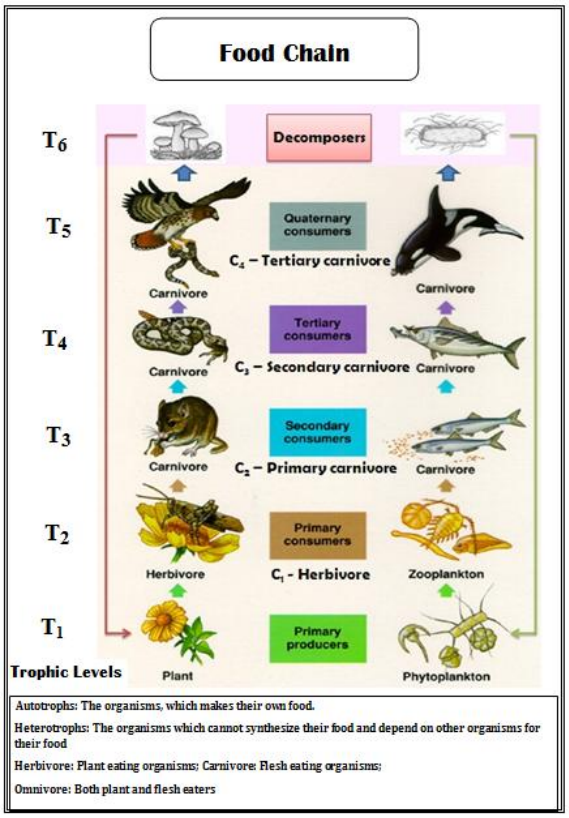
6.2 DIFFERENT TROPHIC LEVELS OF FOOD CHAIN

Aim

To study different trophic levels and how the energy flows in the ecosystem

Materials Required

Food chain chart



Procedure

Step 1

Using the food chain chart, explain the following.

- ☞ An ecosystem contains different kinds of organisms.
- ☞ The organisms which trap the sunlight and prepare the organic food from the inorganic materials are called producers. Green plants, algae, cyanobacteria come under this category. There is a flow of energy from sun to the living matter of plants.

- The energy that plants trap is transferred to a number of organisms in the ecosystem. The organisms which eat plants or plant eaters are called consumers. They cannot capture the energy from the sun as plants do, hence all animals are consumers.
- As one organism eats another, each time, energy enters a different organism, it is said to enter a different trophic level, which is step or stage in the flow of energy.
- The producers capture the energy directly from the sun, hence they occupy the first trophic level (T_1).
- Animals that feed directly on plants are called as herbivores or primary consumers and occupy the second trophic level (T_2).
- Animals that eat other animals are called carnivores or secondary consumers and can be sub divided depending on what they eat.
- Animals that feed on herbivores are called primary carnivores and occupy the third trophic level (T_3).
- Animals that feed on primary carnivores are called as secondary carnivores and occupy fourth trophic level (T_4).
- Animals that feed on secondary carnivores are called as tertiary carnivores and occupy fifth trophic level (T_5).
- Some animals are carnivores and also eat plants, they are called omnivores. They can be fitted into respective trophic level depending on what they ate at the moment.
- The organisms like bacteria, fungi feed on the dead and decay. These are called as decomposers. These decompose the organic matter into water, ammonia, carbon dioxide and other simple organic molecules. They occupy the top most trophic level and connect with the first trophic level (producers).

6.3 FOOD WEB

Aim

To study the energy flow in the food web

Materials Required

Chart papers, sketch pens, thread.

Procedure

Step 1

Make cards out of chart paper. The size of each card should be about 5 inches x 3 inches.

Distribute the cards and sketches to all the students.

Step 2

Ask them write an organism name on the card. Encourage the students to write names of different organisms. (Plants, grass, dog, hen, rabbit, lion, cow, fox, elephant, frog, grasshopper, spider, termites, bacteria, fungi, eagle, parrot, rat, cat, deer, wolf etc)

Ask one student to write Sun on his card.

Step 3

Using the thread, make a tag to the card and wear it as identity card.

Step 4

Take all the students to an open area and ask them stand logically (flow of food and energy) as per their tags. The sun should stand in the center and rest should arrange accordingly.

Once they stand, ask them to connect themselves using thread.

Try for aquatic ecosystem also.

Observation

Does this look like network/web? What can be the name for this web?

Inference

This makes a food web which includes several food chains, which are embedded and linked with each other.

7. FOOD AND NUTRITION

Generally we take food like rice, chapati, idli, vegetables, sambar, milk, meat, egg etc. a meal could consists of chapathi/roti, dal and vegetable curry, another may be rice, sambar and vegetable, yet another meal would be roti, fish curry and curd. Thus each dish is made up of one or more ingredients, which are obtained from plants or animals. These ingredients contain some components that are needed by our body. These components are called nutrients.

The food which we take contains both organic and inorganic components. Carbohydrates, proteins and fats are the major organic components present in the food and these are required in larger quantities, hence referred as macronutrients. On the other side, Mineral salts and vitamins are the inorganic components of food, which are required in lesser quantities (but important) and are referred as micronutrients. In addition to these our food also contains dietary fibre and water which are also required for the body. Thus there are seven (carbohydrates, proteins, fats, mineral salts, vitamins, fibre, water) essential components in our food.

The following table describes the roles and sources of different nutrients

S.No	Nutrient	Function	Sources
1	Carbohydrates (Energy providing foods)	Main source of energy	Potato, Sweet potato, Bread, Rice, Wheat, Honey, Common sugar, Jiggery, Milk, Pizza, Burger, Jams, Jellies, noodles.
2	Proteins (Body building foods)	1. For body building 2. For digestion 3. Growth 4. Energy 5. Body protection	Pulses (peas, soya bean), Egg, Meat, Paneer, Cheese, Milk, Fish.
3	Fats (Energy providing foods)	1. Energy source 2. Taste and flavor 3. Reserve food source	Butter, Cheese, Vegetable oils (coconut oil, ground nut oil, sunflower oil), Nuts, Milk, Animal fat from meat
4	Water	1. Medium for body reactions 2. Transport of substances	

		3. Digestion 4. Waste removal 5. Maintenance of constant body temperature	
5	Fibre	1. Being rich in fibre, absorbs water and helps in movement of food inside the intestine 2. Helps in bowel movement	Spinach, Cabbage, Beans, Peas, Cereals, Wheat, Lady's finger

Minerals

Minerals are important for various functions. They are required in small quantities. Minerals have no energy value.

S.No	Mineral (Chemical element)	Function	Sources
1	Calcium	1. Bone and teeth formation 2. Blood clotting 3. Muscle activities	Bread, Flour, Cheese, Milk, leafy vegetables, Pulses, Eggs, Meat
2	Potassium	Nerve impulse conduction	Beef, Eggs, Milk, Cheese, Potatoes.
3	Sodium	Nerve impulse conduction	Salt, Cheese, Butter, Bread
4	Iron	1. Blood haemoglobin formation 2. Muscle myoglobin formation 3. Enzyme activity	Bread, Flour, Meat, Liver, Eggs, Leafy vegetables
5	Iodine	Thyroid gland function	Iodized salt, Sea fish
6	Phosphorous	1. Bone and teeth formation 2. Nucleic acid formation 3. Energy transfer 4. ATP	Fish, Eggs, Meat, Milk, Cheese, Potatoes, Bread
7	Magnesium	1. Energy transfer 2. Bone and teeth formation	Green vegetables, Cheese, Fruits

Vitamins

Vitamins are neither body building nor energy giving foods, but are very very important for proper functioning of our bodies. They are required by the body in very small quantities.

S.No	Vitamin	Function	Sources	Deficiency
1	Vitamin A	Good sight	Milk, Butter, Cheese, Tomatoes, Carrots, Liver oil	Night blindness
2	Vitamin B complex	Digestion and growth	Milk, Eggs, Cheese, Meat, Liver, Cereals, Pulses	Beriberi (nervousness, loss of appetite, paralysis)
3	Vitamin C	Muscles and Teeth	Citrus fruits (orange, lemon), Green vegetables, tomatoes	Scurvy (bleeding of gums and swelling of joints)
4	Vitamin D	Strong bones and teeth	Milk, Yellow of egg, Liver, Fish. (Even sunlight)	Rickets (decaying teeth, weak bones) in children
5	Vitamin K	Blood clotting	Leafy vegetables, Spinach, cabbage	Hemorrhage (bleeding)

Types of food based on their role

Energy Giving Foods	Body Building Foods	Protecting Foods
Cereals (wheat, rice, maize) Sugar Jaggery Potato Sweet potato Honey Oil and fats	Milk Pulses (peas, soya bean) Cheese Eggs Fish Meat	Fruits Green leafy vegetables (Spinach, cabbage, cauliflower) Carrot Tomato Milk Egg

7.1 NUTRITIENT PERCENTAGE GAME

Aim

To study the nutrient percentage valves present in food samples.

Materials Required

Nutrient percentage cards

Cabbage (100 gm)	
Carbs	5.2 g
Proteins	1.1 g
Calories	22
Fats	0.1 g
Vitamin A	2 %

Orange (100 gm)	
Carbs	11.3 g
Proteins	0.9 g
Calories	45
Fats	0.1 g
Vitamin A	4 %

Pineapple (100 gm)	
Carbs	11 g
Proteins	0.5 g
Calories	42
Fats	0.1 g
Vitamin A	1 %

Beetroot ((100 gm)	
Carbs	10 g
Proteins	1.7 g
Calories	44
Fats	0.2 g
Vitamin A	1 %

Grapes (100 gm)	
Carbs	15.8 g
Proteins	0.6 g
Calories	62
Fats	0.3 g
Vitamin A	2 %

Mango (100 gm)	
Carbs	17.5 g
Proteins	0.6 g
Calories	65.2
Fats	0.5 g
Vitamin A	16 %

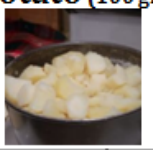
Cherry (100 gm)	
Carbs	18.7 g
Proteins	1.2 g
Calories	74
Fats	0.2 g
Vitamin A	1 %

Coconut (Flesh100 gm)	
Carbs	13 g
Proteins	3 g
Calories	220
Fats	30 g
Vitamin A	0 %

Cauliflower (100 gm) 	
Carbs	5.3 g
Proteins	2 g
Calories	25
Fats	0.1 g
Vitamin A	0 %

Mushroom (100 gm) 	
Carbs	3.2 g
Proteins	3 g
Calories	21
Fats	0.3 g
Vitamin A	0 %

Carrot (100 gm) 	
Carbs	10.5 g
Proteins	1 g
Calories	45
Fats	0.3 g
Vitamin A	36.8 %

Potato (100 gm) 	
Carbs	25 g
Proteins	2.1 g
Calories	108
Fats	0.1 g
Vitamin A	0 %

Banana (100 gm) 	
Carbs	23.1 g
Proteins	1.1 g
Calories	90
Fats	0.3 g
Vitamin A	1 %

Green Peas (100 gm) 	
Carbs	11.4 g
Proteins	4.1 g
Calories	62
Fats	0.2 g
Vitamin A	34 %

Brinjal (100 gm) 	
Carbs	8.1 g
Proteins	0.8 g
Calories	33
Fats	0.2 g
Vitamin A	1 %

Cucumber (100 gm) 	
Carbs	2 g
Proteins	0.3 g
Calories	10
Fats	0 g
Vitamin A	2 %

Cashew nuts (100 gm) 	
Carbs	22 g g
Proteins	14 g
Calories	480
Fats	38 g
Vitamin A	0 %

Apple (100 gm) 	
Carbs	13.9 g
Proteins	0.0 g
Calories	53
Fats	0.0 g
Vitamin A	1 %

Apricots (100 gm) 	
Carbs	81.4 g
Proteins	4.4 g
Calories	313
Fats	0.7 g
Vitamin A	94 %

Almonds (100 gm) 	
Carbs	23.4 g
Proteins	22.9 g
Calories	621
Fats	53.4 g
Vitamin A	0 %

Procedure

Step 1

Call 10 students. Give one nutrient percentage card to each student from the percentage nutrient card set.

Step 2

Ask them to stand in order of protein percentage in the nutrient percentage card that they have.

Once they form a line, ask each student to say what food card they have and how much percentage of protein in it

Step 3

Repeat the same game with another set of 10 learners for carbohydrate percentage and other nutrients

Observation

Students get an idea that different foods contain different amounts of nutrients.

Inference

Different foods are rich in different nutrients. It is important to have a balanced diet so that the body gets all the required nutrients in the right quantities.

7.2 SIMPLE TEST FOR STARCH

Aim

To find out the presence of starch in the given food samples

Materials Required

Test tubes, rice flour, dropper, iodine solution, bread slices, potato pieces and banana pieces

Procedure

Step 1

Take a pinch of rice flour in a test tube.

Step 2

Pour some water in the test tube to make a solution.

Step 3

Add two/three drops of iodine solution into the test tube.

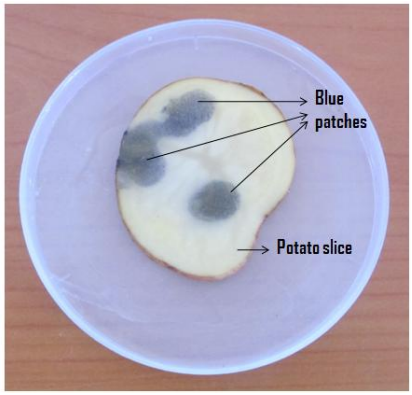
What do you observe?

Step 4

Take the fresh slices of potato, apple, bread etc and place a drop of iodine solution on the slices.

Observation

Solution turns bluish black, similarly blue colour is obtained with bread, potato on adding a drop of iodine.



Inference

Iodine gives blue colour with starch. The appearance of blue colour indicates the presence of starch.

(Recall the learning from Box 1 starch granules in potato, are the results same? Link this to the action of saliva on starch in Box 3)

7.3 SIMPLE TEST FOR SUGARS

Aim

To detect the presence of sugars in the given food samples

Materials Required

Benedicts reagent, glucose, test tube, test tube holder, spirit lamp, spatula, match box, dropper, potato, banana and apple.

Procedure

Step 1

Take crushed pieces of potato, apple and glucose solution in three separate test tubes.

Step 2

Add 4 to 6 drops of Benedict's reagent to the test tubes.

Step 3

Gently heat the test tubes one by one by using a test tube holder.

What do you observe? Compare your results with reference on reagent bottle.

Heating the solution

Solution turning to orange

Comparing with the reference on bottle

Observation

The test tube containing crushed apple and glucose solution turns to red colour and no change is observed in test tube containing potato.

Inference

Development of red colour indicates the presence of sugars.

Benedict's solution contains copper ions which are blue. When heated with the sugar solution, the colour changes to brick red as Cu^{++} ions get reduced to Cu^{+} ions during heating.

7.4 SIMPLE TEST FOR PROTEINS

Aim

To find out the presence of proteins in the given food sample

Materials Required

Toor dal, Sodium hydroxide, copper sulphate, test tubes, spatula, water, beakers, mortar and pestle and measuring cylinder

Preparation of copper sulphate solution: Dissolve 2 gm of copper sulphate in 10 ml of water.

Preparation of sodium hydroxide solution: Dissolve 10 gm of sodium hydroxide in 100 ml of water.

Procedure

Step 1

Take some Toor dal in the mortar and grind it with the help of pestle, add water to it to make a solution.

Step 2

Transfer the Toor dal solution to test tube and add 3 drops of copper sulphate solution and 10 to 12 drops of sodium hydroxide solution and shake well.

Observe the colour change

Step 3

Repeat the experiment for different food sample like rice, wheat, biscuit, corn powder, gram dal, urid dal etc.

Observation

The solution develops a violet colour

Toor dal solution

Development of violet colour on adding $CuSO_4$ & NaOH

Inference

Purple or violet colour indicates the presence of proteins in the given sample.

7.5 SIMPLE TEST FOR FATS

Aim

To find out the presence of fats in the given food sample

Materials Required

Ground nuts, dry coconut piece, butter paper/A4 sheet

Procedure

Step 1

Take 2 or 3 pieces of ground nuts and wrap them in a paper and gently crush them. Take care that the paper does not tear.

The food items to be tested should be completely dry.

Step 2

Now, straighten the paper and observe it carefully over the light

What do you observe?

Step 3

Rub a piece of dry coconut on the plain paper and observe over light. Repeat the same for other food items.

Observation

Oil patches are formed on the paper on crushing with ground nuts and rubbing with dry coconut.

Inference

An oily patch on the paper shows that food contains fat.