



# AMAZING Science

TEACHER'S HELP BOOK



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## LONG ANSWER TYPE QUESTIONS

1. The process of watering crop plants in the fields is called irrigation.

Two methods of irrigation are :

- In the sprinkler system of irrigation, water from a tube-well is allowed to flow through the main pipeline under pressure with the help of a pump, it escapes from the rotating nozzles. This water gets sprinkled on the crop plants as if it is raining.
- In the drip irrigation system, there is a network of narrow pipes (or tubes) with small holes, in the fields. When water flows through the narrow pipes, it falls drop by drop at the position of roots of the plants. There is no run-off (or wastage) of irrigation water.

2. Nitrogen fixation is the process by which atmospheric nitrogen is converted into nitrogen compounds mainly soluble nitrates.

Rhizobium lives in the root nodules of leguminous plants such as bean and peas and converts atmospheric nitrogen into nitrogenous compounds. The nitrogenous compounds are taken in by plants through their roots and utilised in synthesising plant proteins and other compounds. When plants die, the nitrogenous compounds present in their body are converted back to nitrogen and released into the atmosphere by certain denitrifying bacteria. This cycle continues and is known as the nitrogen cycle.

3. The sowing of seeds with a seed drill has the following advantages :

- By using a seed drill for sowing, the seeds are sown at correct depth and correct intervals (or spacings).
- The seeds sown with a seed drill are in regular rows.
- When the seeds are sown by a seed drill, the seeds get covered by soil and hence these seeds cannot be picked up and eaten by birds.
- Sowing by using a tractor-driven seed drill saves time and labour.

4. A fertiliser is an organic compound containing the necessary plant nutrients like nitrogen, phosphorus or potassium, to make the soil more fertile. Some examples of fertilisers are : Urea and NPK (N = Nitrogen, P = Phosphorus, K = Potassium).

The chemical fertilisers have plant nutrients in a concentrated form. So, they provide quick replenishment of plant nutrients in the soil and restore its fertility. Chemical fertilisers are made in factories. Chemical fertilisers are easy to transport, store and handle because they come in bags.

The chemical fertilisers can be applied before sowing, during irrigation or sprayed on standing crops. The excessive use of fertilisers is harmful due to the following reasons :

- The excessive use of fertilisers changes the chemical nature of soil and makes the soil less fertile.
- The excessive use of fertilisers causes water pollution in ponds, lakes and rivers, etc.

5. (i) **Weeding** : The unwanted plants which grow along with a cultivated crop are called weeds. The process of removing weeds from a crop field is called weeding. It is necessary because weeds compete with crop plants for water, nutrients, light and space. The best time for removal of



weeds is before they produce flowers and seeds. Weeding is done by hand, using a trowel or by spraying special chemicals called weedicides.

- (ii) **Threshing** : After harvesting, the grains have to be separated from the harvested crop. The process of separating grains from the chaff is called threshing. Threshing can be done manually or with the help of a machine called thresher.
- (iii) **Harvesting** : The process of cutting and collecting the mature crop is called harvesting. A sickle is used for harvesting by farmers. In big farms, large machines called harvesters are used to cut crops.

### HOTS TYPE QUESTIONS

1. (a) Crop rotation (b) The Rhizobium bacteria present in the root nodules of legumes fix the nitrogen gas of the atmosphere to form nitrogen compounds. Some of the nitrogen compounds go into the soil and replenish it.
2. Harvesting.

## 2

## Microorganism

### LONG ANSWER TYPE QUESTIONS

1. A medicine which stops the growth of, or kills the disease-causing microorganisms is called an antibiotic. The source of antibiotic medicines are microorganisms. Some of the common antibiotics which are made from fungi and bacteria are Penicillin, Streptomycin, Erythromycin and Tetracycline. Antibiotics kill the disease-causing microorganisms but usually do not damage human body cells.

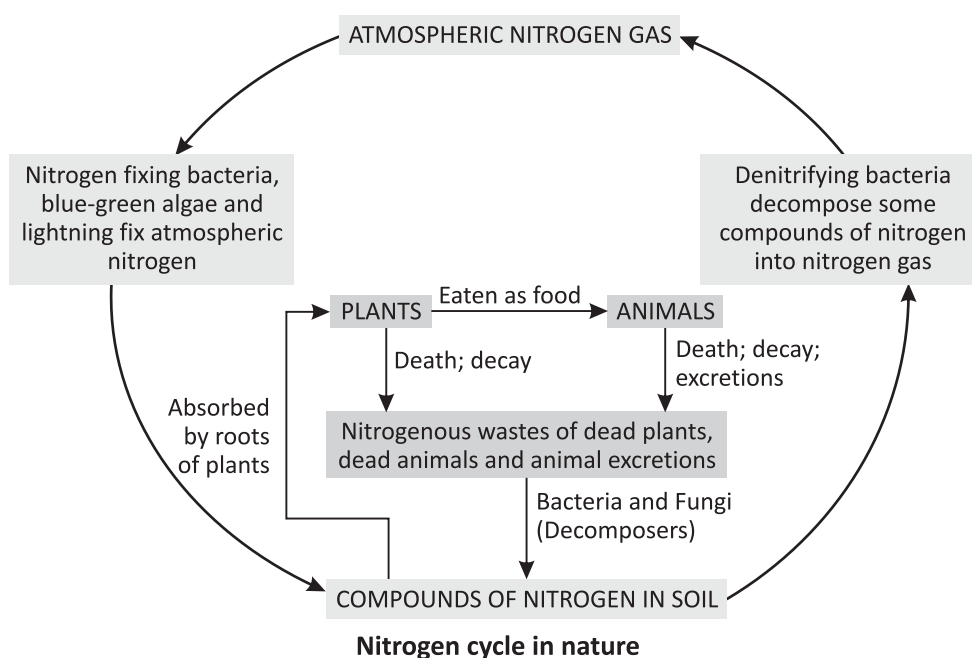
Antibiotics are however not effective against diseases caused by viruses. Some of the precautions to be observed in the use of antibiotics are as follows :

- (i) Antibiotics should be taken only on the advice of a qualified doctor.
  - (ii) A person must complete the 'full course' of antibiotics prescribed by the doctor.
  - (iii) The antibiotics should be taken in proper doses as advised by the doctor. If a person takes antibiotics in wrong doses (or when not needed), it may make the antibiotics less effective when the person might need it in future.
  - (iv) Antibiotics should not be taken unnecessarily. Antibiotics taken unnecessarily may kill the useful bacteria in the body and harm us.
2. Some of the beneficial effects (or uses) of microorganisms are as follows :
    - (i) Microorganisms are utilised in the making of curd, bread and cake.
    - (ii) Microorganisms are used in the production of alcohol, wine and acetic acid (vinegar).
    - (iii) Microorganisms are used in preparation of medicines (or drugs) called antibiotics.
    - (iv) Microorganisms are used in agriculture to increase the fertility of soil by fixing atmospheric nitrogen gas (to form nitrogen compounds).
    - (v) Microorganisms clean up the environment by decomposing the organic matter of dead plants, dead animals and animal wastes into harmless and useful simple substances. In this way, microorganisms help in the recycling of materials in nature.



- The disease caused due to the presence of a large number of microorganisms in the food or due to presence of toxic substance in food by the action of microorganisms, is called food poisoning. The major symptoms of food poisoning are : Vomitting, Diarrhoea (Loose motions), Pain in abdomen, Headache and Fever. The microorganisms (like bacteria and fungi) which cause food poisoning come into food from the air, dirty hands, unclean food containers, flies, cockroaches, insects, rats, or sick farm animals. The two most common examples of bacteria which cause food poisoning are bacteria Salmonella and bacteria Clostridium botulinum. An example of fungus which causes food poisoning is Aspergillus.
- The food materials like milk, fruits, vegetables, meat, fish and cooked food, etc., get spoiled easily. This is because they contain a lot of water due to which the food-spoiling microorganisms can grow in them easily. The process in which the food materials are given a suitable physical or chemical treatment to prevent their spoilage is called food preservations.

Some of the methods for preserving foods are : (i) Sun-drying (or Dehydration) (ii) Heating (iii) Cooling (or Refrigeration), (iv) Deep freezing (v) Addition of common salt.



Lightning in the sky is responsible for nitrogen fixatation.

### HOTS TYPE QUESTIONS

- (a) (i) Aedes mosquito (ii) Dengue  
(b) (i) Anopheles mosquito (ii) Plasmodium (iii) Malaria (c) Female (d) Female.

S.No.	Human disease	Causative microorganism	Mode of transmission
(i)	Tuberculosis	Bacteria	Air
(ii)	Measles	Virus	Air
(iii)	Chickenpox	Virus	Air/Contact
(iv)	Polio	Virus	Air/Water
(v)	Cholera	Bacteria	Water/Food
(vi)	Typhoid	Bacteria	Water



S.No.	Human disease	Causative microorganism	Mode of transmission
(vii)	Hepatitis B	Virus	Water
(viii)	Malaria	Protozoan	Mosquito
(ix)	Dengue	Virus	Mosquito

# 3

## Synthetic Fibres and Plastics

### LONG ANSWER TYPE QUESTIONS

- The waste plastic articles (like polythene bags, etc.) thrown here and there carelessly get into dirty water drains and sewers, and clog them (block them). This makes the dirty drain water (or sewer water) to flow over the streets and roads causing unhygienic conditions.
  - Sometimes the animals (like cows) eat up the used polythene bags or plastic wrappers along with the left-over food and vegetable wastes thrown on garbage dumps. The plastic wastes can choke the respiratory system of these animals or form a plastic lining in their stomach. This can cause the death of these animals.

S.No.	Thermoplastic	Thermosetting plastic
(i)	A plastic which can be softened repeatedly by heating.	A plastic which once set does not become soft on heating.
(ii)	It can be moulded into different shapes again and again.	Cannot be moulded a second time.
(iii)	They are flexible.	They are hard and rigid.
(iv)	Can be bent easily without breaking.	Cannot bend.
(v)	Articles made of thermoplastics can be recycled.	Cannot be recycled.
(vi)	<b>Examples :</b> Polythene and PVC.	<b>Examples :</b> Bakelite and Melamine.

S.No.	Synthetic fibres	Natural fibres
(i)	They have high resistance to abrasion.	They have low abrasion resistance.
(ii)	They absorb very little water. Hence, dry up quickly.	They absorb a lot of water. Do not dry up quickly.
(iii)	They are wrinkle resistant.	They are not wrinkle resistant.
(iv)	They are light weight.	They are comparatively heavy.
(v)	They have a very smooth texture.	They do not have a very smooth texture.
(vi)	They do not shrink.	They shrink after washing.

- Uses of Nylon :** Used for making textiles like sarees, shirts, socks and rock climbing ropes.

**Uses of Polyester :** Used for making conveyer belt, sails of sail-boats, etc.

**Use of Acrylic :** Used for making sweaters, shawls, blankets, jackets, etc.



**Use of Rayon :** Used in textile industry for making sarees, dresses, socks and carpets (mixing with wool).

**Use of Plastics :** Used to make buckets, mugs, parts of radio, T.V., cars, buses, etc.

5. Polyester is a synthetic fibre. The monomers used in making polyester fibres are made from petrochemicals. Most of the properties of polyester fibres are similar to those of nylon. However they are stronger and softer than nylon fibres. Polyester fabric is suitable for making dress materials. PET is a popular polyester which is used for making bottles due to its light weight and high transparency.

### HOTS TYPE QUESTIONS

- (a) Ethene (b) Amide (c) Petrochemicals
- Can be recycled : Plastic toys, Plastic covering on electrical wires, Carry bags, Plastic bottles, Plastic chairs—All these are made of thermoplastics, Cannot be recycled : Telephone instruments, Cooker handles, Electric switches, Ballpoint pens—All these are made of thermosetting plastics.

# 4

## Materials : Metals and Non-Metals

### LONG ANSWER TYPE QUESTIONS

1.	S.No.	Metals	Non-metals
	(i)	Metals are good conductors of heat and electricity	Non-metals are poor conductors of heat and electricity.
	(ii)	Metals are malleable and ductile.	Non-metals are neither malleable nor ductile.
	(iii)	Metals are lustrous and can be polished.	Non-metals are usually non-lustrous and cannot be polished.
	(iv)	Metals are solid, except mercury.	Non-metals can exist in all three states.
	(v)	Metals have generally high melting points and boiling points.	Non-metals generally have low melting points and boiling points.
	(vi)	Metals are sonorous.	Non-metals are not sonorous.

### 2. Uses of metals :

- Copper metal is used for making electric wires for household wiring.
- Aluminium foils are used for packaging medicines, chocolates, food items, etc.
- Iron metal is used to make nails, screws, nut-bolts, pipes, railings, gas cylinders, buildings and bridges, railway lines, transport vehicles such as cars, buses and trains,
- Silver and gold metals are used to make jewellery.
- Mercury metal is used in making thermometers.

### Uses of non-metals :

- Oxygen is used for respiration and combustion process. It is filled in oxygen cylinder for artificial respiration.



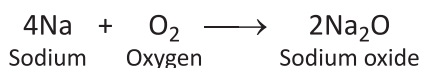
- Nitrogen is used in making fertilisers. It is also used in preparing ammonia.
- Carbon is abundant in nature. It is used as coal for fuel, as graphite in leads of pencils, as lubricants and electrodes. Diamond is used in jewellery due to its brilliance. Carbon is also used in making plastics, nylon and rubber.
- Iodine is used as an antiseptic. A solution of iodine in alcohol is known as tincture of iodine. Iodine is used in iodised salt.
- Helium is used to fill balloons; argon is filled in bulbs and neon is used in advertisement signs.

S.No.	Metals	Non-metals
(i)	Metals react with oxygen to produce oxides which are basic in nature.	Non-metals react with oxygen to produce oxides which are acidic in nature.
(ii)	Metals react with water differently to produce oxides and hydroxide.	Non-metals generally do not react with water.
(iii)	Metals react with acids to produce hydrogen gas.	Non-metals generally do not react with acids.
(iv)	More reactive metals displace the less reactive metals from their compounds in an aqueous solution.	Non-metals do not show any such reaction.

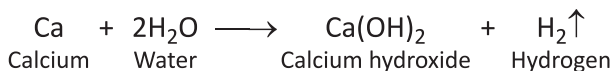
4. An alloy is a homogeneous mixture of two or more metals or a metal and a non-metal. They are made by mixing metals in molten state and sometimes non-metals.

#### Properties of Alloy :

- (a) They are resistant to corrosion and wear and tear.
- (b) They are resistant to attack by chemicals.
- (c) They are stronger, harder and better conductors than the constituent metals.
5. (i) **Reaction with air** : Metals are converted into their oxides by the action of oxygen present in air.



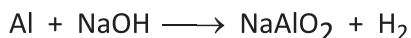
- (ii) **Reaction with water** : Different metals react with water at different temperatures to evolve out hydrogen. Some metals react with water at room temperature and some metals which are less reactive react with hot water while other metals react only with steam.



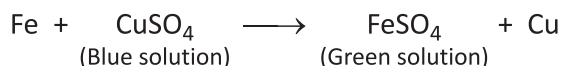
- (iii) **Reaction with acids** : Metals react with acids and produce hydrogen gas that burns with a 'pop' sound.



- (iv) **Reaction with bases** : Metals react with sodium hydroxide to produce hydrogen gas.



- (v) **Displacement reactions** : More reactive metals displace less reactive metals from their compounds in aqueous solutions.





## HOTS TYPE QUESTIONS

1. We cannot store lemon pickle in an aluminium vessel because the acid present in lemons will react with aluminium metal or utensil to form toxic salts which can make us sick and damage our health.
2. Reaction (a) will not occur because copper is less reactive than zinc.

# 5

## Coal and Petroleum

### LONG ANSWER TYPE QUESTIONS

1. Even long before the dinosaurs lived on this Earth, most of the Earth was just oceans with tiny sea organisms, called the phytoplankton. With the passage of time these died and sank to the bottom of the sea and slowly got covered with silt and sand. The sand and sediments formed impervious sedimentary rocks. Pressure due to the weight of these rocks and heat of the Earth converted the dead plants and animals into petroleum over a million of years.
2. Over long periods of time the Earth was covered by swampy forests filled with giant ferns and club mosses. Due to natural processes like earthquakes, volcanoes etc. these forests were buried under the surface of earth. They kept accumulating in layers and eventually formed a soggy, dense material called peat.

With the passage of time, sand, clay and other mineral matter got accumulated over them, compressed them and squeezed the water out. High pressure, heat, bacterial action and absence of air gradually change the wood of buried forest plants and trees slowly to coal.

3. Use of natural gas is increasing due to :
  - (a) Easy transportation through pipelines directly to the site where it to be used. This saves the cost of transportation.
  - (b) It burns easily and produces a lot of heat.
  - (c) It is less polluting.
4. The burning of fossil fuels produces gases like carbon dioxide, sulphur dioxide, smoke, etc. These gaseous products and smoke cause air pollution. This air pollution leads to respiratory problems in human beings. It causes suffocation and may even cause death. Sulphur dioxide produced while burning of fossil fuels combines with rain water to form sulphuric acid. This polluted rain containing sulphuric acid is called acid rain. Carbon dioxide is a greenhouse gas which leads to increase in average temperature of our Earth.
5. The various fractions of petroleum and their uses :
  - (i) **Petroleum Gas** : Petroleum gas is used as a fuel in homes and industry.
  - (ii) **Petrol** : Petrol is used as a fuel in light motor vehicles (such as cars, motorcycles, and scooters, etc.)
  - (iii) **Kerosene** : Kerosene is used as a fuel in wick stoves and pressure stoves to cook food.
  - (iv) **Diesel** : Diesel is used as a fuel in heavy motor vehicles (such as buses, trucks, tractors, and diesel train engines).
  - (v) **Lubrication Oil** : Lubricating oil is used for lubrication in machines and engines (like car engines).



## HOTS TYPE QUESTIONS

- (a) Coal (b) (i) Solid (ii) Black (c) (i) Carbonisation (ii) Destructive distillation (d) (i) Coke (ii) Coal gas (iii) Coal tar.
- P : Natural gas, Q : Methane, R : Hydrogen, S : Compressed natural gas (CNG).

# 6

## Combustion and Flame

### LONG ANSWER TYPE QUESTIONS

- Methods to extinguish fire :

(a) Water as a fire extinguisher. (b) Carbon dioxide as a fire extinguisher.

**Carbon dioxide as a Fire Extinguisher :**  $\text{CO}_2$  is the best fire extinguisher for fires. It cuts off the contact between the burning combustible substance and oxygen supply. Carbon dioxide being heavier than oxygen, surrounds the burning combustible substance like a blanket. The advantage of carbon dioxide is that, it does not harm the electrical equipment.

S.No.	Combustible Substances	Non-combustible Substances
(i)	Substances that can burn easily to produce heat and light are called combustible substances.	The substances that do not burn are called non-combustible substances.
(ii)	Example : cloth, paper.	Example : Cement, Soil

- Rapid Combustion :** The combustion reaction which takes place very fast is called rapid combustion, *e.g.*, burning of cooking gas, burning of wax in candle.

**Spontaneous Combustion :** If combustion starts on its own in the given conditions, it is termed as spontaneous combustion, *e.g.*, forest fires, burning of white phosphorus.

**Explosion :** Rapid combustion in which sound is produced along with heat and light is called as explosion, *e.g.*, crackers, bombs.

- A flame is a region where combustion of gaseous substances takes place.

**Attributes of a Good fuel :**

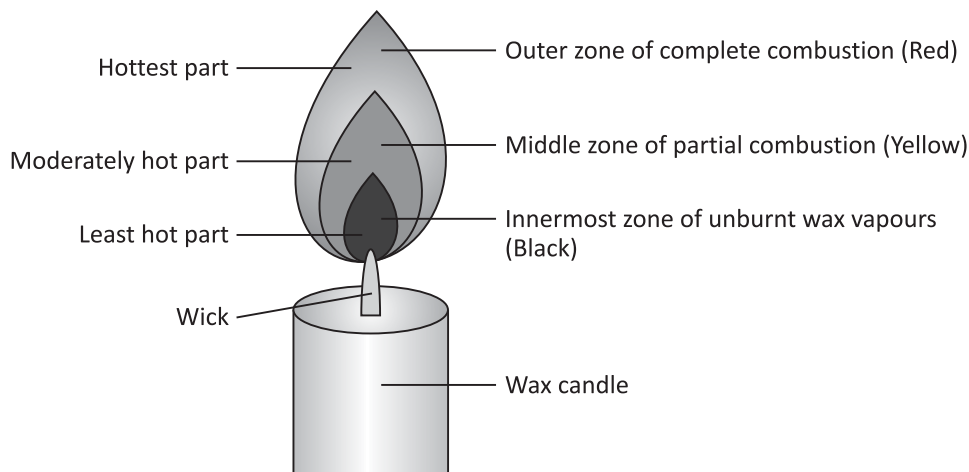
- Fairly cheap and easily available.
- Easy to transport.
- Should not cause pollution on burning.
- Moderate ignition temperature.

- Various zones of a candle flame :**

- Zone of Complete Combustion :** Outermost region of the flame gives off a blue light. Due to the sufficient amount of oxygen available, complete combustion occurs and  $\text{CO}_2$  is formed. It is the hottest part of the flame.
- Zone of Incomplete Combustion :** Further below the blue flame is a region that gives off yellow light. It is yellow because unburnt soot (carbon) particles glow, giving off light like the filament of a light bulb. It produces a moderate temperature.







**The three zones of a candle flame**

- (c) **Zone of No Combustion** : Further inside it, there is the innermost zone which is black in colour due to the presence of unburnt wax of fuel vapours. It is the coldest part of the flame.

### HOTS TYPE QUESTIONS

- It is because in incomplete combustion carbon burns to form carbon monoxide.
- Sodium bicarbonate (Sodium hydrogencarbonate).
  - The heat of fire decomposes sodium bicarbonate to produce carbon dioxide gas. This carbon dioxide covers the fire like a blanket and cuts off supply of fresh air to the burning substance. Due to this the fire gets extinguished.
  - Potassium bicarbonate (or potassium hydrogencarbonate).

## 7

## Conservation of Plants and Animals

### LONG ANSWER TYPE QUESTIONS

- Biosphere reserve is a specified area in which multiple use of land is permitted for preserving genetic diversity by dividing it into zones each for a particular activity. The concept of biosphere reserves has been evolved by Man And Biosphere (MAB) programme of UNESCO.
  - Sundar ban
  - Great Nicobar
- Various causes of loss of Biodiversity :
  - Destruction of habitat** : Due to construction of a large number of towns and cities for human settlement, industrialisation and construction of dams etc. A large number of habitats were wiped out.
  - Pollution** : Pollution of soil, air and water is endangering many plants and animals.
  - Illegal hunting**: Many animals are under threat because they are hunted down for skin, fur, tusks, claws, meat and other body parts.
  - Global warming** : It is caused due to natural and human-made reasons, has also forced species to adapt to changing environment.



3. Steps for the conservation of wildlife are given below :
- To prevent hunting, killing and capturing of any animals, some law should be made and strictly followed by the people.
  - Hunting and killing of animals should be made a punishable offence.
  - To protect the wildlife and its manipulation, national parks and sanctuaries should be set up.
  - People should be educated about the need and modes of conservation of wildlife.
4. **Extinct animals** : These are those species that have completely disappeared from the earth. The cheetah is believed to have extinct in India since the late 1940s. Other examples include Dodo, Pink headed duck, etc.

**Endangered animals** : They are those species that are in danger of becoming extinct because they are either few in numbers due to loss of their natural habitat or are threatened by change in environmental conditions. Indian elephant, snow leopard, Royal bengal tiger etc. are examples of endangered animals.

5.

S.No.	Wildlife sanctuary	National park
(i)	A wildlife sanctuary may or may not be an area of great scenic beauty.	A national park is an area of great scenic beauty.
(ii)	A wildlife sanctuary protects and preserves the wild animals in their natural environment.	A national park protects and preserves wild animals and their environment as well as the scenic beauty, historical objects and habitats of scientific interest in the area.
(iii)	A wildlife sanctuary is not meant for recreation and enjoyment of the public. It is dedicated to the protection of wild animals only.	In a national park, in addition to protection, wild animals are kept for recreation, enjoyment and educative interest of the public.
(iv)	A wildlife sanctuary usually does not allow easy access to the visitors.	A national park allows easy access for the visitors to the land and wildlife inside it.

### HOTS TYPE QUESTIONS

- In a zoo, wild animals are kept in cages and in captivity, whereas in a wildlife sanctuary, wild animals live in their natural habitat in the forest.
- Yak, Kashmir stag, snow leopard
  - Black buck, Tiger, Kashmir stag, Lion tailed macaque, Snow leopard
  - Dodo, Dinosaur.

# 8

## Cell : Structure and Functions

### LONG ANSWER TYPE QUESTIONS

- See page 94 for the diagram of plant cell and animal cell.
- Nucleus is the largest and the most important organelle of the cell. Nucleus controls all the activities of cell. It contains chromosomes, chromosomes contains genes. The genes are also responsible for passing on hereditary characters from parents to off spring.



### 3. Difference between plants cell and animals cell :

S.No.	Plant cell	Animal cell
(i)	Cell membrane is surrounded by cell wall.	It has only an outer cell membrane.
(ii)	It usually has one or two large vacuoles.	Vacuoles are very small or they may be absent.
(iii)	Nucleus is pushed to one side by the large vacuoles.	Nucleus is generally present in the centre.
(iv)	It has chloroplasts which contain chlorophyll.	Chloroplasts are absent.

4. **Prokaryotic cells** : The cells having nuclear material without nuclear membrane are termed as prokaryotic cells and organisms with these kinds of cells are called prokaryotes. Examples : bacteria and blue green algae.

**Eukaryotic cells** : The cells having well organised nucleus with a nuclear membrane are called eukaryotic cells. The organisms with these kinds of cells are called eukaryotes. For example, all organisms other than bacteria and blue green algae are eukaryotes.

5. The word cell comes from the Latin word '*cellula*', meaning a small room. Robert Hooke, an English scientist, discovered cells as early as 1665. Hooke looked at a slice of cork through a microscope. He found that the thin slices of cork when observed under a crude microscope appeared to be made up of small compartments. These compartments were honeycomb like structures, each separated from the other by a wall. Hooke termed each compartment as cell. These cells were actually dead plant cells. Antonie van Leeuwenhoek first observed living cells. Early work centered on identifying the presence of cells in different types of living materials. As microscopes got better with technology, sub-cellular components (organelles) were discovered.

### HOTS TYPE QUESTIONS

1. Cell membrane is a living part of the cell whereas cell wall is a non-living part of plant cells.
2. A : Nucleus, B : Mitochondria, C : Cell membrane, D : Cytoplasm, E : Chromosomes.

# 9

## Reproduction in Animals

### LONG ANSWER TYPE QUESTIONS

1. The male reproductive organs are called testes (singular : testis). They start producing sperms at puberty. Puberty is the stage at which a person attains sexual maturity, or becomes capable of reproduction.

The testes lie in a sac, called the scrotal sac, which is located outside the abdominal cavity. They produce sperms in large numbers. The sperms collect and mature in a tube, called the epididymis. From here, they travel through a muscular tube, called the vas deferens, into the urethra, which carries the sperms to penis. As the sperms travel through the vas deferens, secretions from various glands pour in. The mixture of secretions and sperms is called semen. The semen (containing sperms) is transferred into the vagina, or the opening of the female reproductive system, by the penis. Sperms have a head and a long tail. The tail helps them swim towards the ovum.



- Millions of sperms are released inside the vagina. Some of these travel upwards into the uterus and gradually reach the oviduct. When the ovary releases an ovum it reaches the oviduct and fuses with the sperm, leading to fertilisation. Only one sperm is capable of fertilisation of an ovum. The fertilisation results in the formation of zygote.
- Amoeba can reproduce by the method of binary fission. The binary fission in a fully grown amoeba starts when its nucleus lengthens and divides into two parts. After that, the cytoplasm of amoeba divides into two parts around each nucleus. In this way, a single parent amoeba divides to form two smaller daughter amoeba.
- External fertilisation** : The fertilisation that occurs outside the body of an animal is referred to as external fertilisation. The organisms lay or discharge their gametes outside the body where fertilisation take place.

**Internal fertilisation** : In this process, the eggs remain inside the female's body and the sperm are placed inside her body by the male.

- Viviparous animals** : The animals which give birth to young ones are called viviparous animals. For example, cat, dog, cow and human beings.

**Oviparous animals** : The animals which lay eggs are called oviparous animals. In such animals development of embryo takes place outside the female body. For example, all birds and reptiles.

### HOTS TYPE QUESTIONS

- It is a technology used to produce an animal that has the same genetic material as another living or previously existing animal.
- (a) (i) Frog (ii) Tadpole (b) Metamorphosis (c) Lungs and skin (d) Gills

10

## Reaching the Age of Adolescence

### LONG ANSWER TYPE QUESTIONS

- At puberty, in case of males, the primary sex organs, *i.e.*, testes and the secondary sex-organ, *i.e.*, penis develop completely. They start producing the male gametes, *i.e.*, sperms. In case of females, the primary sex organ, *i.e.*, ovaries enlarge and start releasing mature eggs or ova. This leads to onset of menstruation cycle also.

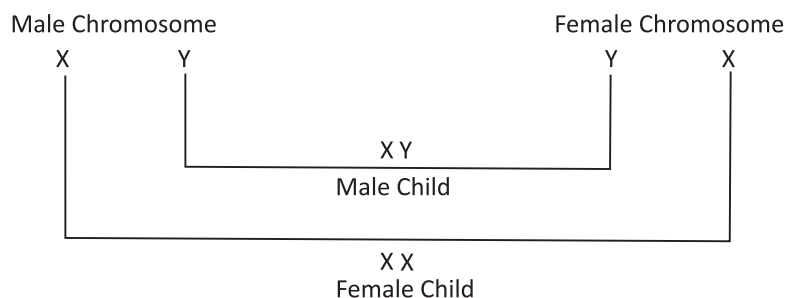
- Hormones from pituitary stimulate testes and ovaries to release testosterone (in male) and estrogen (in female)

Released in the blood stream and reach parts of the body (Target site)

Stimulate changes in the body at onset of puberty



3. (a) Growth hormone is secreted by pituitary gland. It controls the growth of bones and muscles. A person having the deficiency of growth hormone in childhood remains very short and becomes a dwarf. On the other hand, a person having too much growth hormone becomes very tall (or a giant).  
 (b) Thyroxine is secreted by thyroid gland. It controls the rate of body's metabolism. Iodine is necessary for the synthesis of thyroxine. Therefore, a deficiency of iodine in diet can cause a deficiency of thyroxine hormone in body.
4. (a) **Nutritional needs of adolescents** : The diet of adolescents should include food items made from cereal grains, pulses, fruit, vegetables, meat, fish, eggs and milk.  
 (b) **Personal hygiene** : It is needed to prevent the occurrence of diseases. Everyone should have a bath, changing the clothes daily, wash hands.  
 (c) **Physical exercise** : It builds and maintains healthy muscles, bones and joints. It also improves the mental health.
5. If the sperm carrying the X chromosome fertilises the egg (which carries only X chromosome) at fertilisation, the zygote would have two X chromosomes and develop into a female child.



If the sperm carrying the Y chromosome fertilises the egg (which carries only X Chromosomes) at fertilisation. The zygote would have one X and one Y chromosome and develops into a male child.

### HOTS TYPE QUESTIONS

1. (a) (i) Menstruation (ii) Periods  
 (b) Puberty  
 (c) That the reproductive system of human female has started working  
 (d) Beginning of pregnancy  
 (e) Menopause
2. (a) X (b) X (c) Y (d) X

11

## Force and Pressure

### LONG ANSWER TYPE QUESTIONS

1. (a) Muscular force, (b) Magnetic force, (c) Gravitational force, (d) Electrostatic force, (e) Frictional force.



2. **Muscular Force** : The force resulting due to the action of muscles is known as muscular force. We use our muscular force also during walking, running, pushing, etc.

**Electrostatic Force** : The force exerted by a charged body on another charged or uncharged body is known as electrostatic force.

**Frictional Force** : The force acting along the two surface in contact which oppose the motion of one body on the other is called the force of friction.

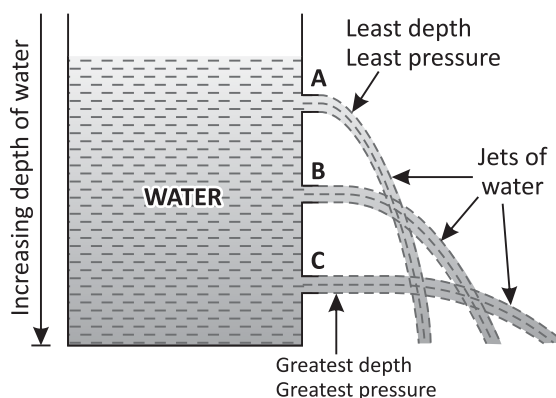
3. Difference between contact forces and non-contact forces :

S.No.	Contact force	Non-contact force
(i)	The forces involve physical contact between two bodies on which they act are called contact forces.	The forces do not involve physical contact between two bodies on which they act are called non-contact forces.
(ii)	Example–Muscular force, frictional force.	Example–Magnetic force, electrostatic force.

4. The pressure exerted by a liquid changes with depth in the liquid. The pressure exerted by a liquid increases with increasing depth inside the liquid. Actually, as the depth of liquid increases, the weight of liquid column pushing down from above increases, and hence the pressure also increases.

It can be demonstrated by using the apparatus as shown in adjoining figure. A tall vessel has three short and thin tubes A, B and C fitted at different depths from the diameters and corks are fitted into them. The vessel is filled with water and then all the corks are removed quickly.

The depth of water near tube A is small so the water comes out from tube A with smaller pressure and falls nearer the bottom of the vessel. The depth of water near tube B is greater, so the water comes out with greater pressure from tube B and falls farther away from the base of vessel. The depth of water near tube C is the greatest, so the water comes out of the tube C with the greatest pressure and goes farthest from the vessel. This means that as the depth of water increases from A to B to C, the pressure of water gradually increases.



**Pressure in a liquid increases with depth**

5. Our body has a liquid called 'blood' which flows through blood vessels into each and every cell of our body. Our blood itself exerts a pressure called 'blood pressure' which is slightly greater than the atmospheric pressure. Since the atmospheric pressure acting on our body from outside is balanced by the blood pressure acting from inside, we do not get crushed. Actually, the atmospheric pressure is so finely balanced by our blood pressure that we do not feel any discomfort.

The drinking straw works on the existence of atmospheric pressure. The lower end of drinking straw is dipped in the soft drink. When we suck at the upper end of the straw with our mouth, the pressure of air inside the straw and in our mouth is reduced. But the pressure acting on the surface of the soft drink is equal to atmospheric pressure. So, the greater atmospheric pressure acting on the surface of the soft drink pushes the soft drink up the straw into our mouth.

### HOTS TYPE QUESTIONS

1. Upward muscular force applied by hand and downward gravitational force applied by earth. The two forces being equal and opposite balance each other and hence do not bring a change in the state of motion.





2. The area of the pointed end of the nail is much smaller than that of its head. The same force produces a sufficient pressure to push the pointed end of the nail into the wooden plank.

12

## Friction

### LONG ANSWER TYPE QUESTIONS

- Friction is useful to us because :
  - We would not be able to walk without friction.
  - We should not be able to write without friction.
  - Brakes on cars and trucks work because of friction.Friction is considered an evil because :
  - It wears away soles of our shoes.
  - Tyres of vehicles wear out gradually due to friction.
  - It wears out the rubbing machine parts.
- The streamlined body reduces the area of contact between the body and the fluid, hence reducing the friction. This is the reason that aeroplanes, ships and boats are given a streamlined body to move easily in air or water.
- When the box starts sliding, the contact points on its surface do not get enough time to lock into the contact points on the floor. So, the sliding friction is slightly less than the static friction and you find it easier to move the box already in motion than to get it started from rest.
- Different ways to increase friction are as follows :
  - Grooves are made in soles of shoes.
  - Shoes are provided with spikes for athletes.
  - Treads are made in the tyres of vehicles.
  - Gymnasts apply some coarse substance on their hands to increase friction for better grip.
  - Machine belts are made of special materials.
- The following ways can be used to decrease friction :
  - By applying lubricants like oil or grease to rubbing surfaces.
  - By making the surfaces smooth by polishing.
  - By giving special shape to bodies moving in air and water (streamlining) or special boats like hovercraft never moves through water. It rides on a layer of air, almost a cushion of air to reduce friction with the water.
  - By using wheels to move objects.
  - By using ball bearings between the moving parts of machines, thus converting sliding friction into rolling friction.

### HOTS TYPE QUESTIONS

- Floor B offers greater friction (because it makes the moving pencil cell stop at a lesser distance of 20 cm).
- (a) Sliding friction (b) Static friction (c) Rolling friction.



## LONG ANSWER TYPE QUESTIONS

- A vibrating object causes air molecules to vibrate. When these vibrations reach our ear, they are collected by the pinna and funneled into the ear tube.

These, then strike the eardrum which starts vibrating with the same frequency. This causes the delicate bones of the middle ear to vibrate. The stimulated tiny hair in the hearing organ, which in turn, sends a signal to the auditory nerve of our nervous system. The auditory nerve takes the signal to the brain and we can then hear the sound.
- Measures to reduce Noise Pollution :

  - Automobiles should be fitted with silencers and soft horns.
  - The horns of motor vehicles should not be blown unnecessarily.
  - We should not play radio, television and stereo system too loudly.
  - The use of loud speakers at social and religious functions should be banned.
  - Avoid bursting fireworks that make loud noise.
- Ill effects of Noise Pollution :

  - It increases nervous tension, irritation, earache, headache, and high blood pressure.
  - It may cause lack of concentration in work or studies.
  - Loud music during night-time disturbs our sleep.
  - Loud noise can even damage the ears permanently and cause deafness.
- Amplitude** : It is the maximum displacement from the mean position of an oscillatory body. it controls the loudness of sound; more the amplitude, more loud the sound is.
  - Frequency** : The number of oscillations in one second is called the frequency. It controls the pitch of the sounds. High pitched sound means high frequency.
- Tabla produces sounds by the vibrations of thin stretched membranes. In a tabla, a thin membrane fixed tightly over a hollow wooden drum vibrates and produces sound. We have to strike the stretched membrane of the instrument with our hands or with sticks to make it vibrate and produce sound.
  - The loudness of sound depends on the amplitude of vibrations of the vibrating object.

## HOTS TYPE QUESTIONS

- X : Ultrasonic sound, Y : infrasonic sound, Z : Audible sound
- (a) 0.002 s (b) 500 hertz (c) Yes, because its frequency is within the hearing range of humans.

## LONG ANSWER TYPE QUESTIONS

- Conductors** : The materials which allow electric current to pass through them are called conductors. Copper and aluminium are good conductors of electricity.





**Insulators** : The materials which do not allow electric current to pass through them are called insulators. Wood and rubber are insulators.

2. **Electrolytes** : Chemical compounds whose molecules ionise into positively and negatively charged ions in a solution are called electrolytes.

**Electrolysis** : The decomposition of an electrolyte by passing an electric current through it, is called electrolysis.

3. See Activity 4 on page 164.
4. Distilled water is a poor conductor of electricity (or a non-conductor of electricity). We can make distilled water (or pure water) to conduct electricity in the following ways :
- (i) We can dissolve some common salt (or any other salt) in distilled water or pure water to make it a good conductor of electricity.
  - (ii) We can add a little of acid (such as dilute sulphuric acid, lemon juice or vinegar) in distilled water or pure water to make it a good conductor of electricity.
  - (iii) We can add a little base (such as sodium hydroxide or potassium hydroxide) in distilled water or pure water to make it a good conductor of electricity.
5. The object to be electroplate, *i.e.*, an iron spoon is made cathode (negative electrode). A thin sheet of pure copper is made anode (positive electrode). An acidified solution of copper sulphate is used as an electrolyte, taken in an electrolytic tank.

When electric current is passed through the acidified copper sulphate solution, copper from copper sulphate solution gets deposited on the surface of iron spoon. Thus, we can say that iron spoon has been electroplated with copper.

### HOTS TYPE QUESTIONS

1. The rainwater falling through the atmosphere dissolves some acidic gases such as carbon dioxide, sulphur dioxide and nitrogen oxides and hence becomes acidic. This acidic rainwater conducts electric current which produces magnetic field and deflects the compass needle.
2. (a) Thick rod of impure copper (b) Thin plate of pure copper (c) Copper sulphate solution

15

## Some Natural Phenomena

### LONG ANSWER TYPE QUESTIONS

1. Lightning conductor is a device used to protect building from the effect of lightning. A metallic rod taller than the building is installed in the walls of the building during its construction. One end of the rod is kept out in the air and the other is buried deep in the ground. If lightning strikes, it will hit the top of the lightning conductor rather than the building. The electric energy of lightning passes through the metal strip and gets discharged safely into the ground through the buried metal plate. Since no electric energy produced by lightning passes through the building, no damage is caused to it.
2. An earthquake is the shaking of the ground due to tremors, both powerful and weak as a result of disturbances within the Earth. We can protect against an earthquake by following points :



- (a) Buildings design should be taken from a qualified architect. A qualified civil engineer should be consulted in making the building.
  - (b) Houses which are made in the high seismic zones, heavy construction should be avoided.
3. See page 171 for diagram of Gold leaf electroscope and charged electroscope.
4. (a) During a thunderstorm contact with telephone cords, electrical wires and metal pipes should be avoided. It is safe to use mobile phones and cordless phones.
- (b) Bathing should be avoided during thunderstorm to avoid contact with running water.
- (c) Electrical appliances like computer, TV, etc. should be unplugged as earliest.
- (d) Air conditioners should be switched off to protect the machinery from damage.
5. Lightning strikes are more frequent in the hilly areas because in such areas clouds are comparatively closer to the ground than in the planes.

A flash of lightning carries a lot of electric energy. When lightning strikes a building, its tremendous electric energy can set the building on fire or cause serious damage to its structure. When lightning strikes a tree, it can burn up the tree and damage it by its enormous electric energy. And when a person is hit by lightning during a thunderstorm, then the electric energy passes through the body of the person due to which the person gets severe burns and gets killed.

### HOTS TYPE QUESTIONS

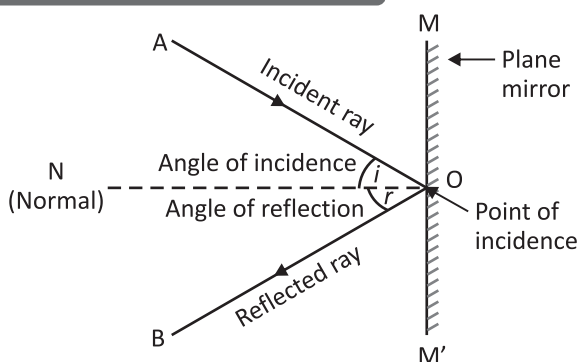
1. A glass rod can be charged by rubbing when held in hand because glass rod is an insulator which does not conduct electric charges produced on its surface through our hand and body into the earth. An iron rod cannot be charged by rubbing when held in hand because iron rod is a conductor due to which as soon as it gets charged by rubbing, the electric charges produced on its surface flow through our hand and body into the earth and it remains uncharged.
2. (a) The aluminium leaves of the electroscope diverge (or open up) when touched by a positively charged object.
- (b) The aluminium leaves of the electroscope diverge (or open up) when touched by a negatively charged object.

# 16

# Light

### LONG ANSWER TYPE QUESTIONS

1. (a)



Reflection of light from a plane mirror



(b) **According to the first law of reflection** : The incident ray, the reflected ray, and the normal (at the point of incidence), all lie in the same plane.

**According to the second law of reflection** : The angle of reflection is always equal to the angle of incidence. If the angle of incidence is  $i$  and the angle of reflection is  $r$ , then :

$$\angle i = \angle r$$

2. **Sclera** : It protects the vital internal parts of the eye.

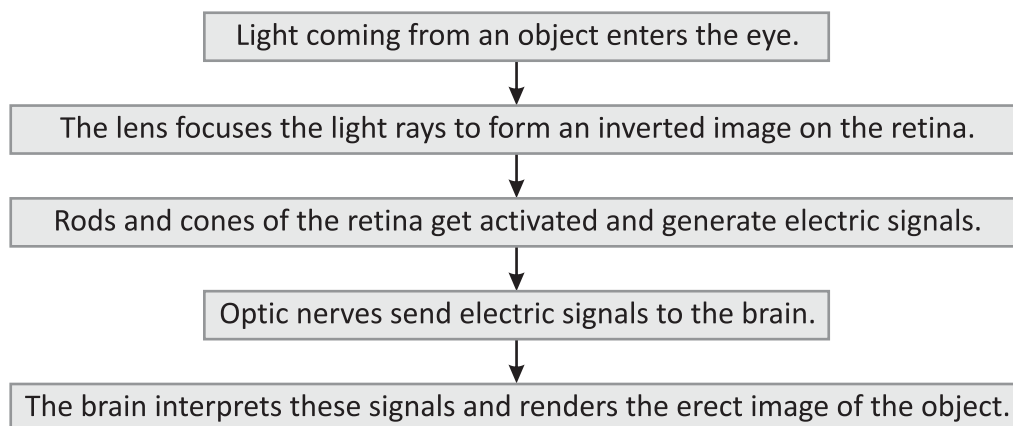
**Cornea** : It protects the eye and also helps in focussing some light.

**Iris** : It is the coloured part of eye and regulates the amount of light entering the eye.

**Choroid** : It darkens the eye from inside and hence, prevents any internal reflection.

3. It is defect of vision in which a person can see a distant object but cannot see a nearby object clearly. It can be corrected by using spectacles with convex lens.

4. Flow chart of working of human eye :



5. Characteristics of images formed by plane mirror are :

(i) The mirror forms erect image.

(ii) Image formed is of the same size as the object.

(iii) The distance of image from the mirror is equal to the distance of object from the mirror.

(iv) It is virtual, it can't be obtained on a screen.

(v) Image is laterally inverted.

### HOTS TYPE QUESTIONS

1.  $25^\circ$ .

2. (a) (i) Hypermetropia (ii) Myopia (b) (i) Convex lenses (ii) Concave lenses.

17

## Stars and the Solar System

### LONG ANSWER TYPE QUESTIONS

1. See page 207 for different phases of the moon with diagram.

Due to changes in the position of the Earth, the moon appears to change its shape. When the



moon is in between the Earth and the Sun, we do not see the moon at all. It is called the new moon. Two or three days after, we see only a part of the moon. This is called crescent moon. Within a week we see half of the moon. This is called the first quarter. When we see more than half of the moon, it is called the Gibbous moon. Gradually, the shape of the bright portion of the moon becomes bigger and bigger. On the fifteenth day, we see the full moon, when the Earth comes between the Sun and the moon. The different shapes of the bright, visible part of the moon as seen from the Earth (during a whole month) are called phases of the moon.

2.
  - (i) Help in spying for military purposes.
  - (ii) Help in television and radio transmission.
  - (iii) Help us to study and forecast the weather by sending cloud pictures to the Earth, taken from space.
  - (iv) Helps to collect information about other planets, stars, galaxies, etc.
  - (v) Help in locating mineral and studying agricultural yield on the Earth by photographing.
3.
  - (i) The Earth has an atmosphere (which contains many gases including oxygen and carbon dioxide).
  - (ii) The Earth has large quantities of water. There can be no life without water.
  - (iii) The Earth has a suitable temperature range for existence of life. The Earth is neither too hot nor too cold.
  - (iv) The Earth has a protective blanket of ozone layer high up in the atmosphere.
4.
  - (i) The Moon is a natural satellite of the Earth.
  - (ii) It revolves around the Earth on a definite regular path.
  - (iii) The Moon is about one-fourth the size of the Earth and its weight is about one-eighth that of the Earth.
  - (iv) Its surface is covered with hard and loose dirt, craters and mountains.
  - (v) On the Moon, days are extremely hot and nights are very cold.
  - (vi) The Moon has no light of its own.
  - (vii) The silvery Moon light is actually the light of the Sun which is reflected by the Moon's surface.
5. Venus is the brightest of all the planets. It is silvery blue in colour. Venus is the second planet from the Sun. It is the closest planet to the Earth. The Venus is the hottest planet. Venus has no satellite. It is also called morning star or evening star. It can however be seen upto four hours before sunrise and four hours after sunset but never at late night.

### HOTS TYPE QUESTIONS

1. Moon takes the same time as Earth to revolve a round the Sun as well as to spin or rotate once about its own axis. Thus, we never see the back side of moon from Earth.
2. The group of stars that has a recognisable shape is called constellation.  
Some common constellations are :
  - (i) **Ursa Major** : It appears during summer time in the early part of the night. It is also known as Big Dipper or Great Bear or the Saptarshi. There are seven prominent stars in this constellation.
  - (ii) **Orion** : This constellation can be seen during winter in the late evenings. It has seven bright stars. Orion is also called the hunter.



- (iii) **Cassiopeia** : It is the most common or prominent constellation in the northern sky. It is visible during winter in the early part of the night. It looks like a distorted letter W or M.



18

## Pollution of Air and Water

### LONG ANSWER TYPE QUESTIONS

- The various methods which can be used to make water potable (or safe for drinking) are :
  - The water from water bodies is pumped and collected in a reservoir or water tank. Heavy unpurified settled down by the sedimentation process.
  - Then water is sent to a filtration tank which has gravel and sand. By the filtration method water get separated. Now the filter water is treated with chlorine to kill the germs and bacteriums in water. This process is called chlorination. The water is now fit for drinking.
  - Water can also be purified by loading with alum. The impurities settle down and clean water is then separated by decantation.
  - Water can also be purified by boiling for about 20 minutes at about 100°C to kill the germs present in water.
- The water of most of the rivers and lakes of our country is highly polluted. All of us should make efforts to reduce the pollution of water sources like rivers and lakes. The various ways of controlling (or minimising) water pollution are as follows :
  - Sewage should be treated property at sewage treatment plants to make it harmless before discharging it into nearby rivers.
  - Farmers should use correct amounts of fertilisers and pesticides in the fields so that excessive amounts of these harmful agricultural chemicals are not washed into rivers, lakes and ponds.
  - All the industries should treat the toxic wastes produced by them suitably to make them harmless before discharging them into rivers.
  - Water pollution prohibition laws which exist for the industries producing toxic chemical wastes should be implemented strictly by the concerned Authorities.
  - Garbage (household waste) should not be thrown into open drains, rivers, lakes or ponds. Dead bodies should not be thrown into rivers. Dead bodies should be cremated or buried properly to prevent pollution of water.
  - People should be made aware of the harmful effects of water pollution so that they may co-operate and help in preventing it.
- The rapid growth of algae in water in the presence of nitrogen and phosphorus is called algal bloom. When there is algal bloom, it covers the whole water surfaces. This has the following effects :
  - The cover of algae does not allow sunlight to reach the aquatic plants. Aquatic plants die in the absence of sunlight, they cannot synthesis their food.

Fish and other aquatic animals do not survive in waste water discharged from milk dairies or sugar mills. Both milk and sugar are not toxic but the decay products of milk and sugar absorb the oxygen



dissolved in water. Oxygen is essential for the aquatic life. So the fish and other aquatic animals and plants die due to the oxygen depletion.

4. Man-made sources of air pollution :
  - (a) Factories and thermal power plants
  - (b) Oil refineries and industries.
  - (c) More use of vehicles also cause air pollution.
  - (d) Stone crushers.
5. (a) Air pollution around Taj Mahal area is discolouring its white marble and also corroding it slowly. This poses a threat to the beauty of Taj Mahal. Actually, various industries in and around Agra are emitting gaseous pollutants such as sulphur dioxide and nitrogen oxides into the air which cause acid rain. The acids present in acid rain react with the marble of Taj Mahal monument and discolour the pure white marble of Taj Mahal by turning it yellowish.
  - (b) Some of the ways of controlling air pollution are given below :
    - (i) The air pollution can be controlled by using smokeless fuels like LPG and Bio-gas for cooking food (instead of wood, cow-dung cakes, or coal).
    - (ii) The air pollution from motor vehicles can be reduced by using CNG (Compressed Natural Gas) as fuel in place of petrol and diesel. CNG is a very clean fuel which does not pollute air.

### HOTS TYPE QUESTIONS

1. Carbon dioxide is the main greenhouse gas which traps Sun's heat rays in the earth's atmosphere by producing greenhouse effect leading up to undue rise in the temperature of Earth's atmosphere.
2. X : Carbon monoxide, Y : Haemoglobin, Z : Oxygen.



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