5 Soldiers of Defense

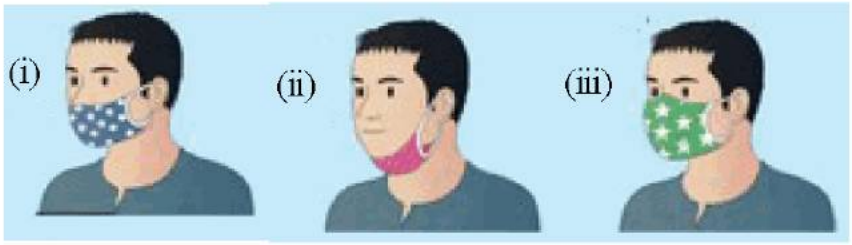
Main concepts

- Defense - Ability of the body to prevent the entry of pathogens and to destroy those that have already entered the body.
- Defense mechanisms in our body - Body coverings and secretions -skin, mucous membrane, mucous, saliva, tear, etc.
- Defense mechanisms in our body - Body fluids - Blood, lymph.
- Skin is the protective covering of the body.
- Epidermis - A protein called keratin present here prevents the entry of germs.
- Sebaceous gland - Sebum produced by the gland makes the skin oily and water proof.
- Sweat gland - The disinfectants present in the sweat produced by this gland destroys the germs.
- The mucous membrane is another protective covering of body parts.
- Body fluids follow different defense strategies like controlling the entry of germs into the body, neutralising germs and the toxic substances they produce, preventing their multiplication, etc.
- White blood cells play a significant role in defense.
- When a wound occurs, that part swells up. This is called inflammatory response.
- Phagocytosis is the process of engulfing and destroying of germs.
- The white blood cells, namely monocytes and neutrophils are phagocytes.
- Blood clotting helps to prevent bleeding and checks the entry of pathogens through wounds.
- Healing of wound is a stage after inflammatory response and blood clotting.
- Fever is a condition when the body temperature rises above the normal level.

- Non-specific defense mechanism - Is a mechanism that protects us from all pathogens without considering their characteristic features.
- Specific defense - The defense mechanism that identifies the structure of each antigen and destroys it specifically.
- Foreign bodies or pathogens that enter the body and stimulate the defense mechanism are called antigens.
- Lymphocytes are of two types - B lymphocytes, T lymphocytes.
- Antibodies - B Lymphocytes produce certain proteins that act against antigens.
- The lymph has a prominent role in defense mechanisms, like the blood itself.
- Immunization - Is the artificial method to make the defense cells alert against the attack of pathogens.
- Vaccines - Substances used for artificial immunization.
- Edward Jenner, an English doctor started immunization.
- Treatment is the final defense.
- Homeopathy is the method of treatment proposed by the German doctor, Sammuel Haniman.
- Hippocrates paved the way for modern medicine. He began a treatment system that discarded superstitious beliefs and emphasized only on pathogens, diagnosis and medicines.
- Advancements in technology have developed various areas of specialization in modern medicine.
- Antibiotics -Medicines that are extracted from microorganisms like bacteria, fungi, etc. and used to destroy bacteria.
- It was Alexander Fleming who first discovered antibiotics in 1928.
- Though antibiotics are effective medicines, their regular use creates many side effects.
- Blood transfusion - The transfer of blood from one person to another.
- The basis of blood grouping is the presence of antigen A and antigen B in red blood cells.
- Everyone cannot receive blood from all blood groups.
- In plants, defense is made possible through structural and biochemical methods.

WORKSHEETS

1. "We should go out by wearing mask properly." This is an instruction from the Department of Health.



(a) Who is wearing mask properly in the above pictures?

(b) What are the advantages of wearing mask?

2. Observe the figures and answer the questions given below.

(i) (ii)

(a) Identify the body coverings indicated as (i), (ii)?

(b) How the useful bacteria habitated in the coverings of the body indicated as (i),(ii) help in defense mechanism?

(c) Complete the table related to the body covering indicated as (i).

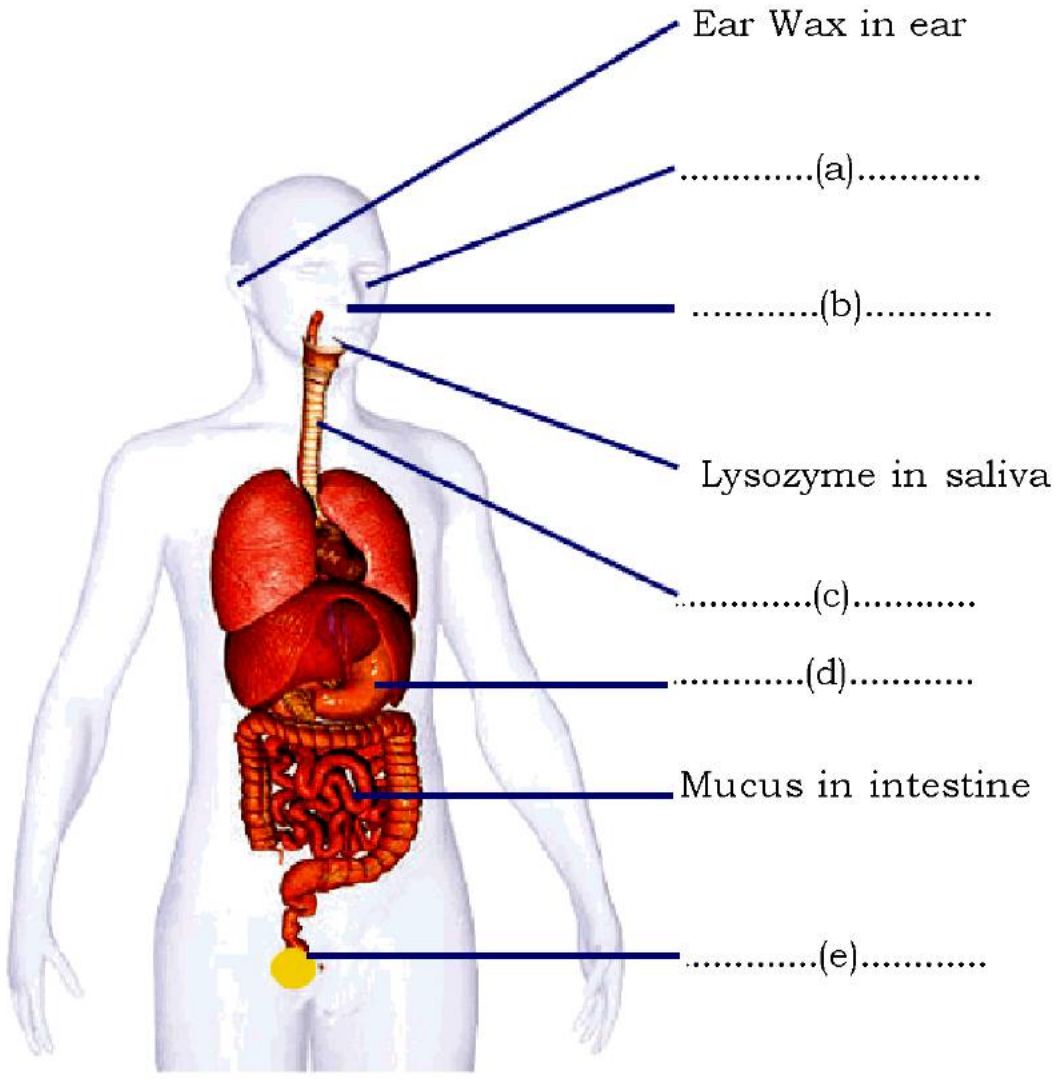
For completing the table, use the data given in the box.

Sebum produced by the gland makes the skin oily and water proof, Sweat gland, A protein called keratin present here prevents the entry of germs, Sebaceous gland, The disinfectants present in the sweat produced by this gland destroys the germs, Epidermis

	Part	Defense activity
X	.....(a).....	.....(b).....
Y	.....(c).....	.....(d).....
Z	.....(e).....	.....(f).....

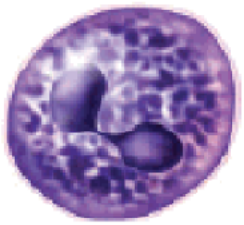
(d) What is the role of the body covering indicated as (ii) in defense?

3. Complete the illustration related to body secretions and defense mechanisms.

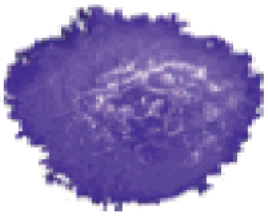


4. Name of White blood cells are given in the box. Identify the White blood cells.

Neutrophil, Lymphocyte, Basophil, Eosinophil, Monocyte

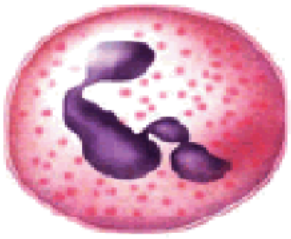


.....(a).....

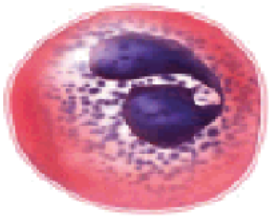


.....(b).....

.....(c).....



.....(d).....



.....(e).....

5. Select the correct statements related to white blood cells.

(a) Eosinophil synthesizes chemicals that destroy bacteria.

(b) Lymphocyte identifies and destroys germs specifically.

(c) Basophil dilates the blood vessels.

(d) Monocyte stimulates other white blood cells.

(e) Neutrophil synthesizes chemicals that destroy bacteria.

(f) Lymphocyte engulfs bacteria.

(g) Basophil synthesizes chemicals that destroy foreign bodies.

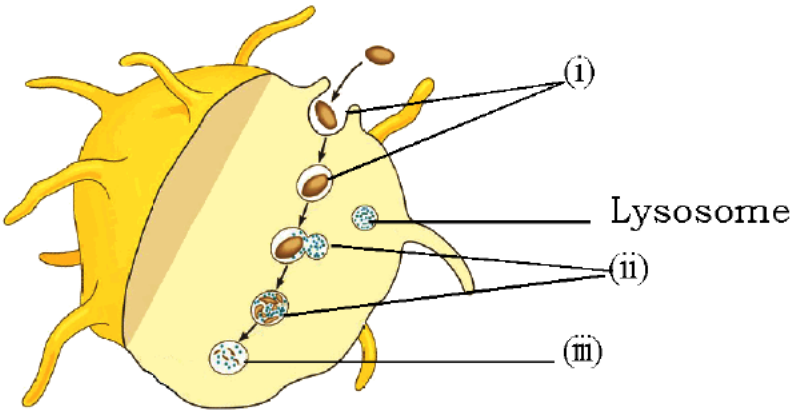
(h) Eosinophil identifies and destroys germs specifically.

(i) Monocytes and neutrophils are phagocytes.

(j) Eosinophil synthesizes chemicals that destroy foreign bodies.

(k) Monocyte engulfs and destroys germs.

6. Observe the illustration and answer the questions given below.



(a) Identify the defense activity.

(b) Name the white blood cells which participate in this defense activity.

(c) Complete the stages [(i), (ii), (iii)] in the above defense activity.

(d) How inflammatory response helps in the defense activity illustrated above?

(e) The stages related to inflammatory response are given below. Arrange them in correct order.

(i) Blood capillaries dilate.

(ii) Neutrophils and monocytes engulf and destroy germs.

(iii) The cells that get damaged by a wound or by an infection produce certain chemical substances.

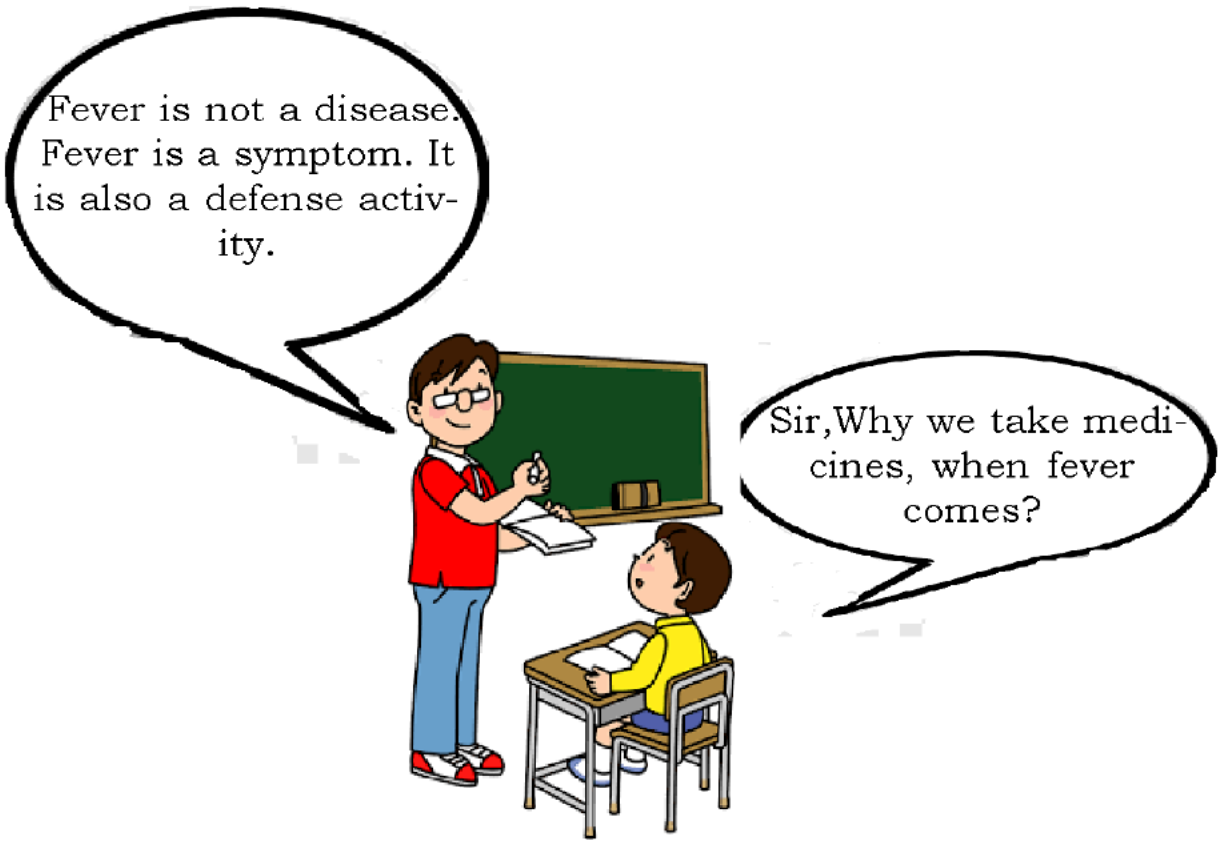
(iv) Germs enter through wounds.

(v) White blood cells reach the wound site through the walls of the capillaries.

7. The stages related to blood clotting are given below. Fill the missing part.

- Tissues and platelets at the site of wound degenerate to form the enzyme called .....(a)..... .
- .....(b)..... $\xrightarrow[\text{Calcium, Vitamin K}]{\text{.....(c).....}}$ Thrombin
- Fibrinogen $\xrightarrow{\text{Thrombin}}$ .....(d).....
- .....(e)..... get entangled in the network of fibrin fibres to form the blood clot.

8. Observe the figure and answer the questions given below.



(a) Do you agree with the statement of the teacher? Why?

(b) What is the normal body temperature?

(c) What explanation can be given to the doubt of the student?

(d) The stages related to fever are given as a flowchart. Complete the flow chart.

Pathogens enter the body.→ ....(i)..... → ....(ii)..... → .....(iii) → ..... Increases the effect of phagocytosis.

9. The statements related to specific defense is given below. Label B to the statements related to B lymphocytes and label T to the statements related to T lymphocytes.

(a) Destroy the bacteria by disintegrating their cell membrane. ☐

(b) Mature in the bone marrow. ☐

(c) Destroy the cells affected by virus. ☐

(d) Destroy the pathogens by stimulating other white blood cells. ☐

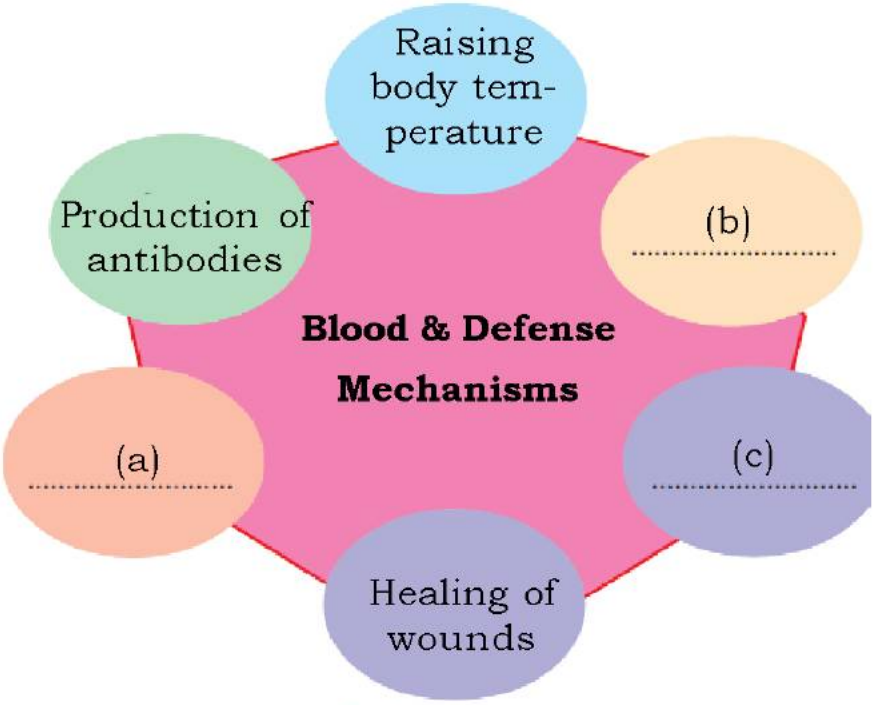
(e) Destroy cancer cells. ____

(f) Mature in the thymus gland. ____

(g) Stimulate other defense cells of the body. ____

(h) Neutralise the toxin of the antigens. ____

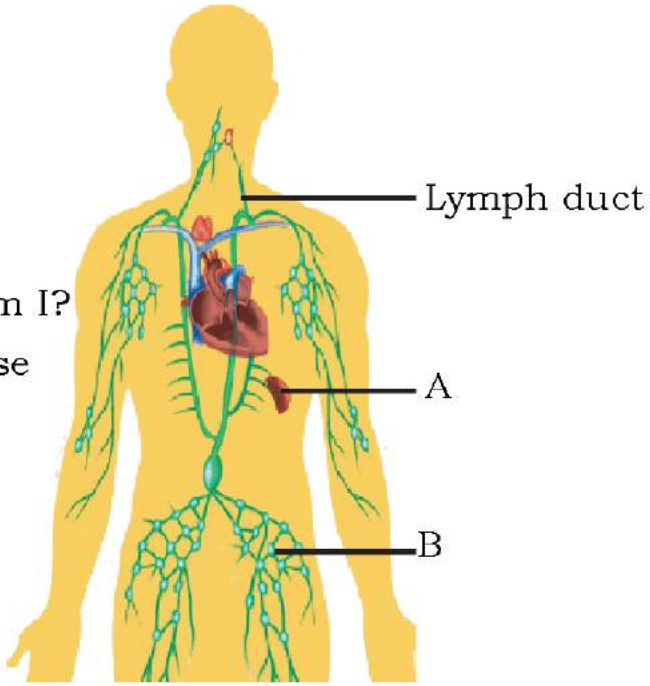
10. Complete the illustration.



11. Observe the figure and answer the questions given below.

(a) Identify the parts indicated as A,B.

(b) "My beginning and end are in the blood." Who am I? What is my role in defense activity?



12. Observe the figures of artificial immunization and answer the questions given below.

(a) Which substances are used for artificial immunization?

(b) What are the components of substances, that are used for artificial immunization? What is the role of this in immunization?

(c) Prepare a poster related to immunization.

(d) Arrange column B with column A.

A. Vaccine	B. Diseases
B.C.G.	Tetanus
O.P.V.	Measles, mumps, and rubella
Pentavalent	Polio
M.M.R.	Diphtheria, tetanus, pertussis,hepatitis B and haemophilus influenzae type b
T.T	Tuberculosis

13. Complete the table related to the diagnostic equipments that are available in the field of medicine and their use.

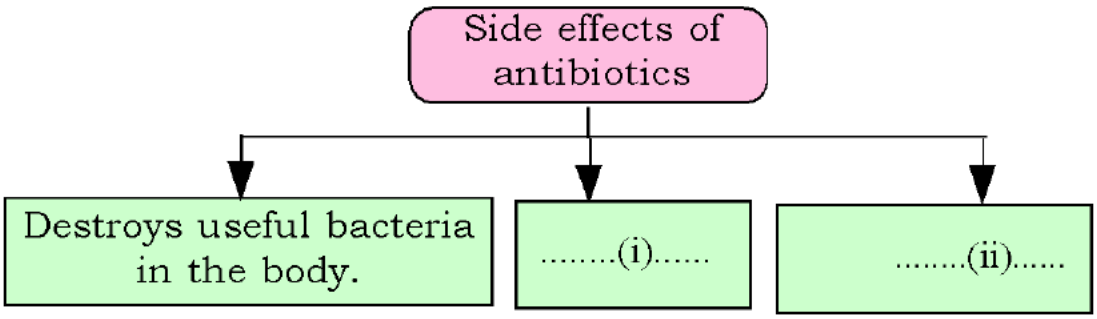
Equipment	Use
.....(a).....	to listen heart beat.
Electro Encephalo Gram	.....(b).....
Sphygmomanometer	.....(c).....
.....(d).....	to understand the structure of internal organs using ultrasonic sound waves.
MRI Scanner	.....(e).....
.....(f).....	to record electric waves in the heart muscle.
C.T. Scanner	.....(g).....
Thermometer	.....(h).....

14 Make suitable pairs.

Hint : Specialization - Related Area

Cardiology, Treatment of eye , Treatment of heart, E.N.T, Cancer treatment, Ophthalmology, Treatment of disorders of the nervous system,Oncology, Neurology, Treatment of ear, nose, and throat disorders.

15. Observe the illustration and answer the questions given below.

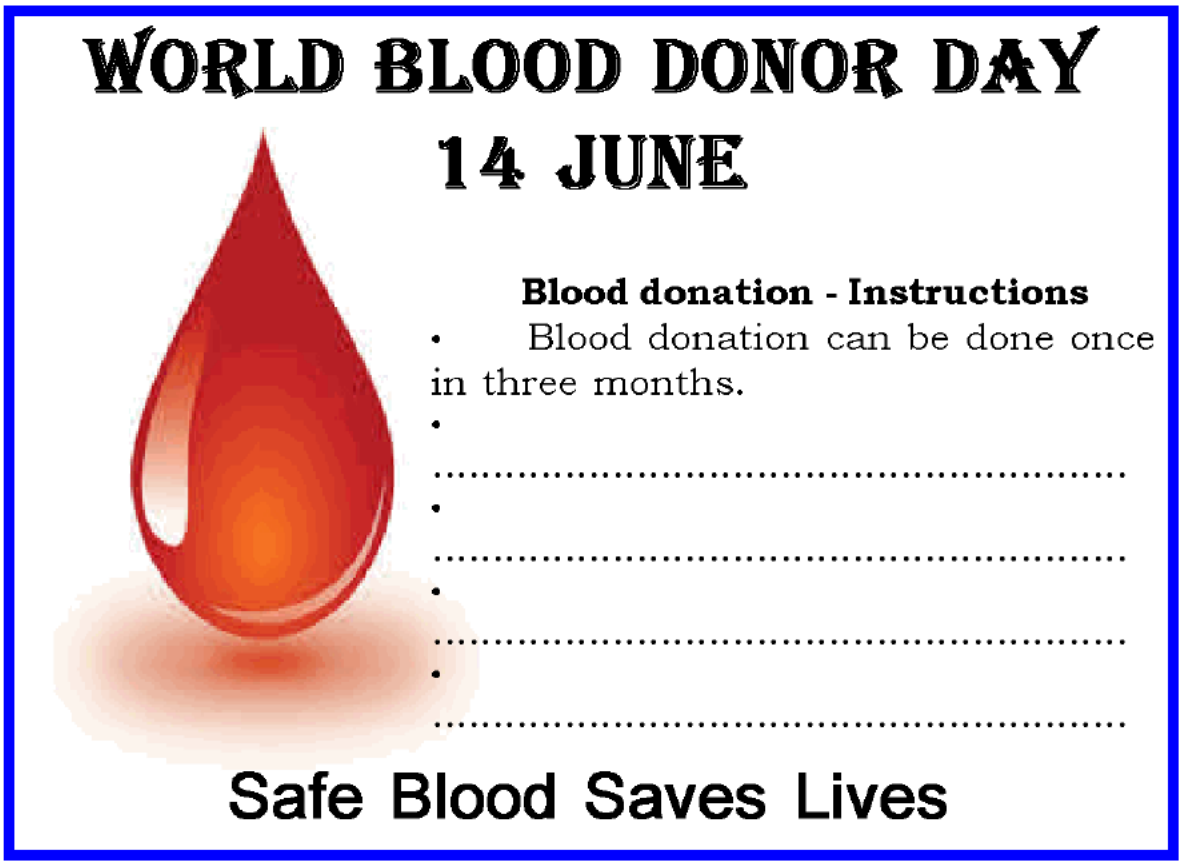


(a) What are antibiotics?

(b) Name the scientist who first discovered antibiotics?

(c) Complete the illustration.

16. Complete the poster related to blood donation.



17. Select the correct statements related to blood groups.

(a) The basis of blood grouping is the presence of antigen A and antigen B in red blood cells.

(b) Antigens are absent in the blood group AB.

(c) Rh factor is present in the plasma.

(d) The blood group of a person is named according to the antigen present in that person's blood.

(e) The blood groups in which Rh factor is present are known as negative blood groups and those without Rh factor are called positive blood groups.

(f) Antigens are absent in the blood group O.

(g) In the blood group B, B antigen and b antibody is seen.

(h) In blood transfusion, certain antibodies present in the blood plasma are of special importance.

(i) In blood group A, antibody b and in group B, antibody a are present.

(j) The basis of blood grouping is the presence of antigen A and antigen B in plasma.

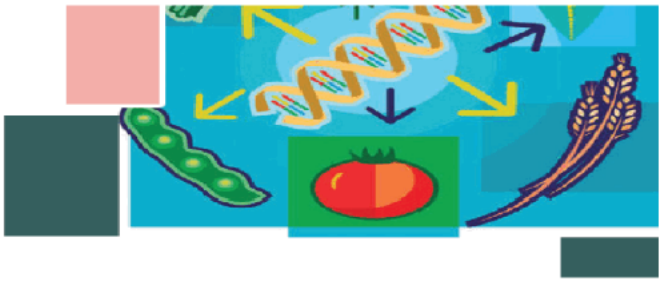
18. Write your opinion about the statement given below. Justify your opinion.

The person with blood group **A** can receive blood from a person with blood group **B**.

19. Complete the table related to Defense Mechanisms in Plants.

Defense Mechanism	Function
Cuticle	.....(a).....
.....(b).....	Protects the inner cells from direct contact of pathogens.
Chemical substances such as lignin, cutin, suberin	.....(c).....
Callose	.....(d).....

6 Unravelling Genetic Mysteries



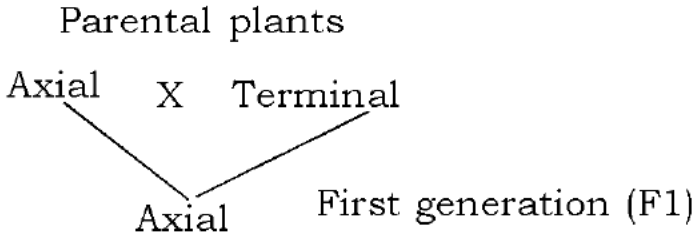
Main concepts

- The transmission of features of parents to offsprings is termed as heredity.
- The features seen in offsprings that are different from their parents are called variations.
- Genetics. - The branch of science that deals with heredity and variations.
- Gregor Johann Mendel is considered as the Father of Genetics.
- A gene that controls a character has different forms. They are called alleles.
- When plants that differ in a pair of contrasting traits are hybridized, only one trait is expressed while the other remains hidden in the offsprings of the first generation.
- During gamete formation the factors that determine a particular character segregate without getting mixed; that is why the traits that remian hidden in the first generation appear in the second generation.
- Mendel explained that the appearance of variations in offsprings is due to the independent assortment of each character.
- It was through further studies that the significance of DNA molecule in the inheritance of characters was made clear. It was also found that the carriers of heredity which Mendel described as 'factors' were the genes present in DNA.
- Two scientists, James Watson and Francis Crick, presented the double helical model of DNA in 1953.
- DNA molecule is made up of units called nucleotides.
- A nucleotide contains a sugar molecule, a phosphate molecule and a nitrogen base.
- Nitrogen bases are molecules that contain nitrogen and are alkaline in nature.

- Since DNA has four kinds of nitrogen bases, namely adenine, thymine, guanine and cytosine, DNA has four kinds of nucleotides too.
- In DNA, the nitrogen base, adenine pairs only with thymine and guanine pairs only with cytosine.
- RNA is another nucleic acid like DNA.
- Ribose sugar is present in RNA.
- In RNA, the nitrogen base uracil is seen instead of thymine in DNA.
- The activity of particular proteins (enzymes) controls metabolic activities and is responsible for specific characteristics.
- DNA does not participate directly in protein synthesis.
- Protein molecule is synthesized by the combined activities of mRNA, tRNA, rRNA and ribosome.
- There are 46 chromosomes in human beings. Of these, 44 are somatic chromosomes and two are sex chromosomes.
- Sex chromosomes are of two types. They are called X chromosome and Y chromosome.
- Females have two X chromosomes and males have one X chromo some and one Y chromosome.
- The genetic makeup of female is 44 + XX and that of male is 44 + XY.
- During the initial phase of meiosis, chromosomes pair and exchange their parts. This process is called crossing over of chromosomes.
- Mutation - A sudden heritable change in the genetic constitution of an organism.
- The X,Y chromosomes of the father determine whether the child is male or female.
- Melanin, a pigment protein imparts colour to the skin.
- It is not racial difference which makes the skin colour dark or light. This is simply an adaptation to live under the sun.
- Races among mankind are only cultural. Biologically, all men are of the same race.

WORKSHEETS

1. The hybridization experiment conducted on the basis of two contrasting traits of the character, position of flowers, in pea plant is illustrated below. Observe the illustration and answer the questions given below.



(a) Name the dominant and recessive traits.

(b) What are the inferences fomulated by Mendel from this hybridization experiment?

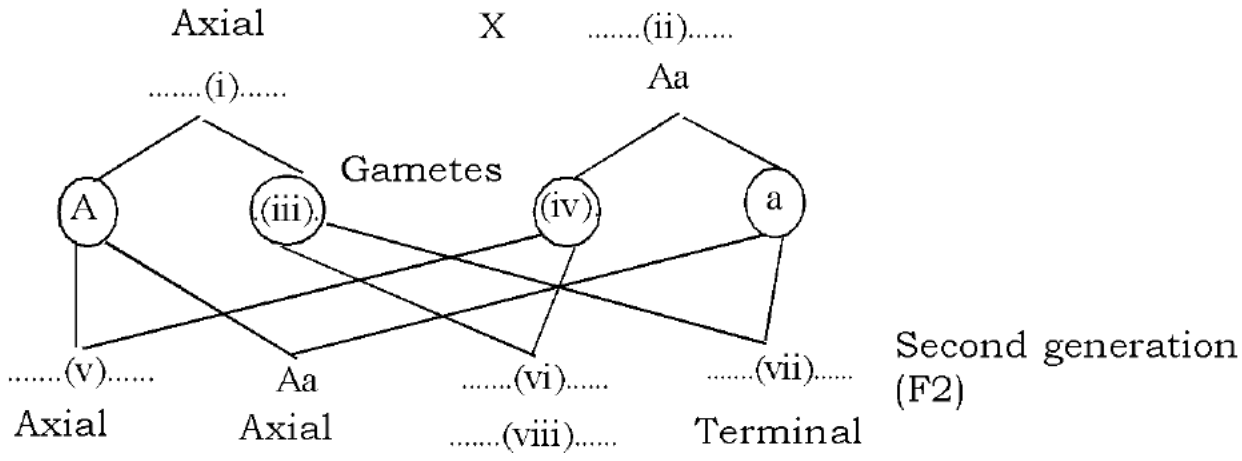
(c) What are the traits obtained in the second generation as a result of self pollination of the first generation plants? In which ratio?

(d) Illustrate the above experiment using symbols.

Hint : Axial - AA, Terminal- aa)

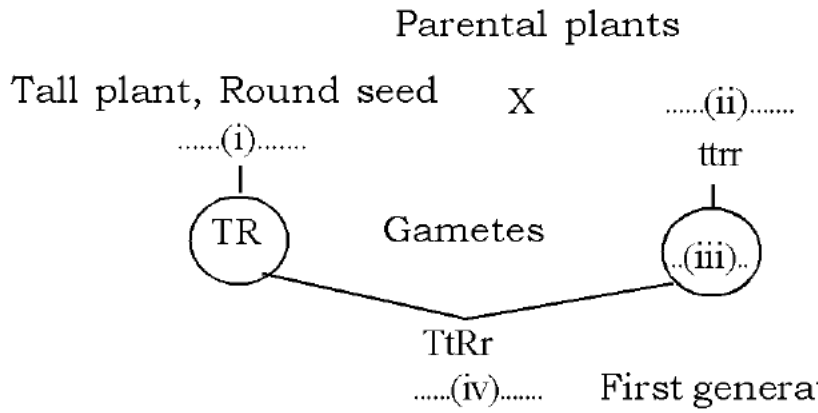
(e) Complete the illustration showing the formation of the second generation by the self pollination of first generation plants.

Self pollination of first generation plant



(f) Why does the recessive trait in the first generation appear in the second generation?

2. The hybridization experiment conducted on the basis of two two characters in pea plants is illustrated below. Observe the illustration and answer the questions given below.



(a) Complete the illustration.

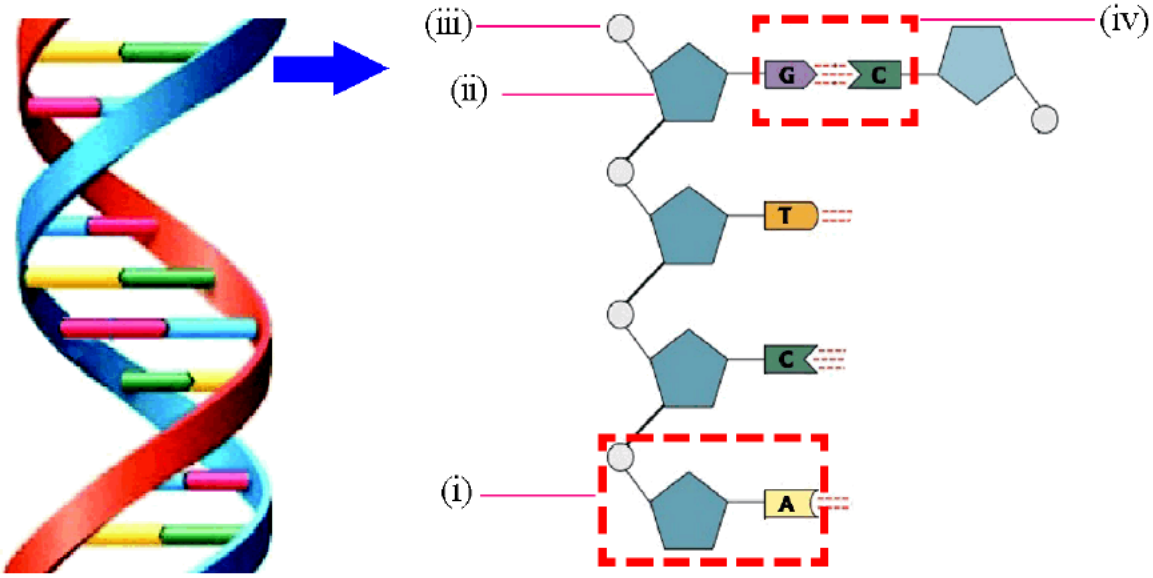
(b) What are the traits obtained in the second generation as a result of the self pollination of first generation plants?

(c) The allele structure of some second generation plants are given below. Write its characters.

(i) TtRR (ii) TtRr (iii) TTRR (iv) ttrr (v) TTrr (vi) ttRR

(d) What are the characters different from parents, appeared in the second generation? What is the reason for the appearance of new combination of characters in offsprings, that were not expressed in parents?

3. Observe the illustration of DNA and answer the questions given below.



A B

(a) Who presented the model indicated as 'A'? Explain the structure as per this model.

(b) Identify the part indicated as (i).

(c) What are the components of the part indicated as (i)? Explain.

(d) Name the molecules indicated as (ii), (iii).

(e) Name the part indicated as (iv). What is the peculiarity of this part?

(f) Redraw this illustration B and complete its second strand.

4. Arrange the following statements suitably in the table given below.

(a) Two stranded.

(b) Contains deoxyribose sugar.

(c) Has four kinds of nitrogen bases, namely adenine, uracil, guanine and cytosine.

(d) Deoxyribonucleic Acid

(e) Single stranded.

(f) Has four kinds of nitrogen bases, namely adenine, thymine, guanine and cytosine.

(g) Ribonucleic Acid

(h) Contains ribose sugar.

DNA	RNA

5. The stages related to action of genes are given below. Arrange them in the correct order.

(a) Based on the information in mRNA, amino acids are added.

(b) mRNA reaches ribosome.

(c) Protein is synthesized.

(d) tRNA brings different kinds of amino acids to ribosome.

(e) mRNA reaches outside the nucleus.

(f) mRNA forms from DNA.

6. The statements related to chromosomes in humans are given below. Select the correct statements.

(a) In human beings there are 22 somatic chromosomes.

(b) There are 46 chromosomes in human beings.

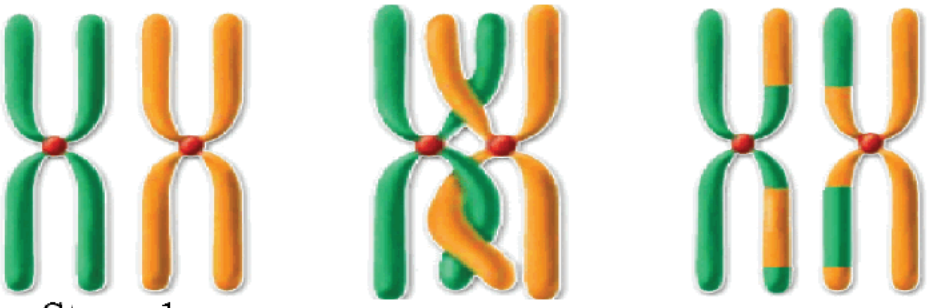
(c) Sex chromosomes are of two types.

(d) Males have two X chromosomes and females have one X chromosome and one Y chromosome.

(e) The genetic makeup of female is 44 + XY.

(f) The genetic makeup of male is 44 + XY.

7. Observe the illustration and answer the questions given below.



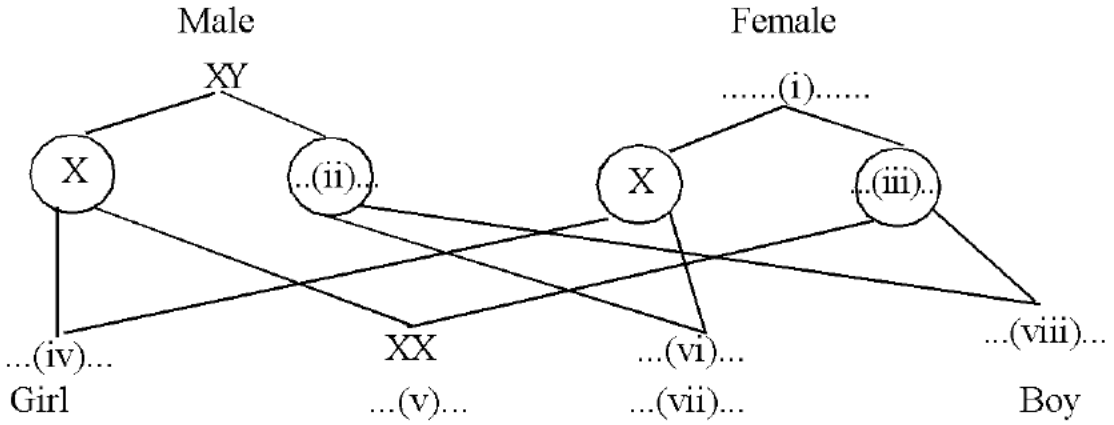
Stage 1 Stage 2 Stage 3

(a) Identify the process.

(b) What is the role of this process in causing variations?

(c) Write another porcess that cause variation. Explain.

8. Observe the illustration and answer the questions given below.



(a) Complete the illustration.

(b) What is the possibility for the birth of a male or a female child?

(c) It is not a fair practice to blame mothers for delivering girl child only. Substantiate your opinion with the help of the above illustration.

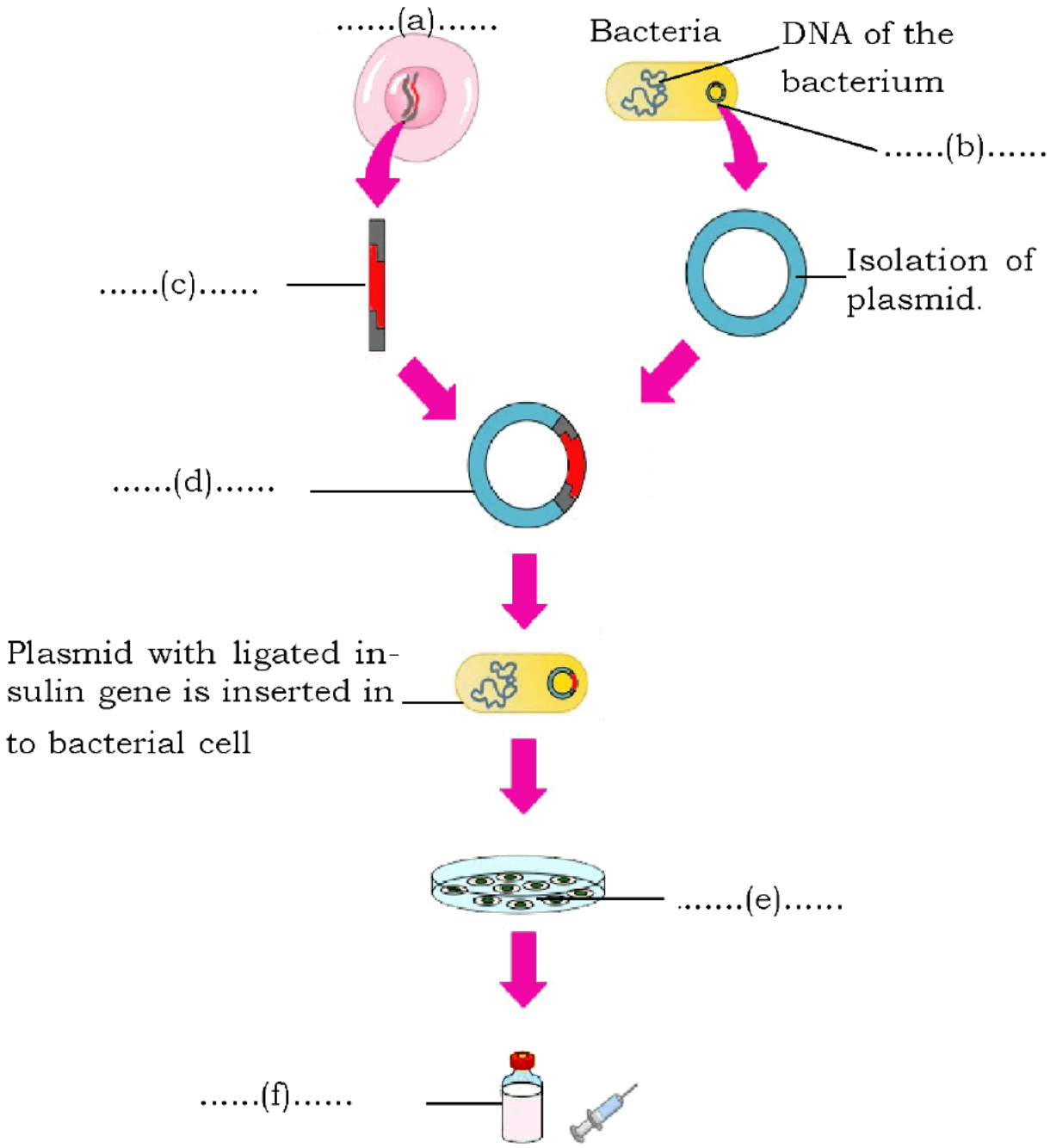
7 Genetics of the Future

Main concepts

- Biotechnology - The use of microorganisms and biological processes for various human requisites.
- Genetic Engineering - The technology of controlling traits of organisms by bringing about desirable changes in the genetic constitution of organisms.
- The basis of genetic engineering is the discovery of the fact that genes can be cut and joined.
- Genetic scissors - Enzymes used to cut genes.
- Genetic glue - Enzymes used to join genes.
- A gene from one cell is transferred to another cell by using suitable vectors.
- Scope of genetic engineering - Gene therapy, Genetically modified animals and crops, Forensic test.
- Gene therapy - A method of treatment in which the genes that are responsible for diseases are removed and normal functional genes are inserted in their place.
- In 1990, the Human Genome Project was started.
- Gene mapping - The technology that helped to identify the location of a gene in the DNA responsible for a particular trait.
- Genome - The complete genetic material present in an organism.
- In human DNA, majority of genes, except the genes that code for protein are non-functional. They are called junk genes.
- One of the future promises of genetic engineering is pharm animals.
- DNA profiling - The technology of testing the arrangement of nucleotides.
- Just like the difference in the finger print of each person, the arrangement of nucleotides in each person also differs.
- Like any other technology, genetic engineering has also been misused.

WORKSHEETS

1. The illustration related to the production of insulin through genetic engineering is given below. Complete the illustration.



2. Analyse the statement and answer the questions given below.

We can produce things essential for humans by bringing about changes in the genetic material of organisms.

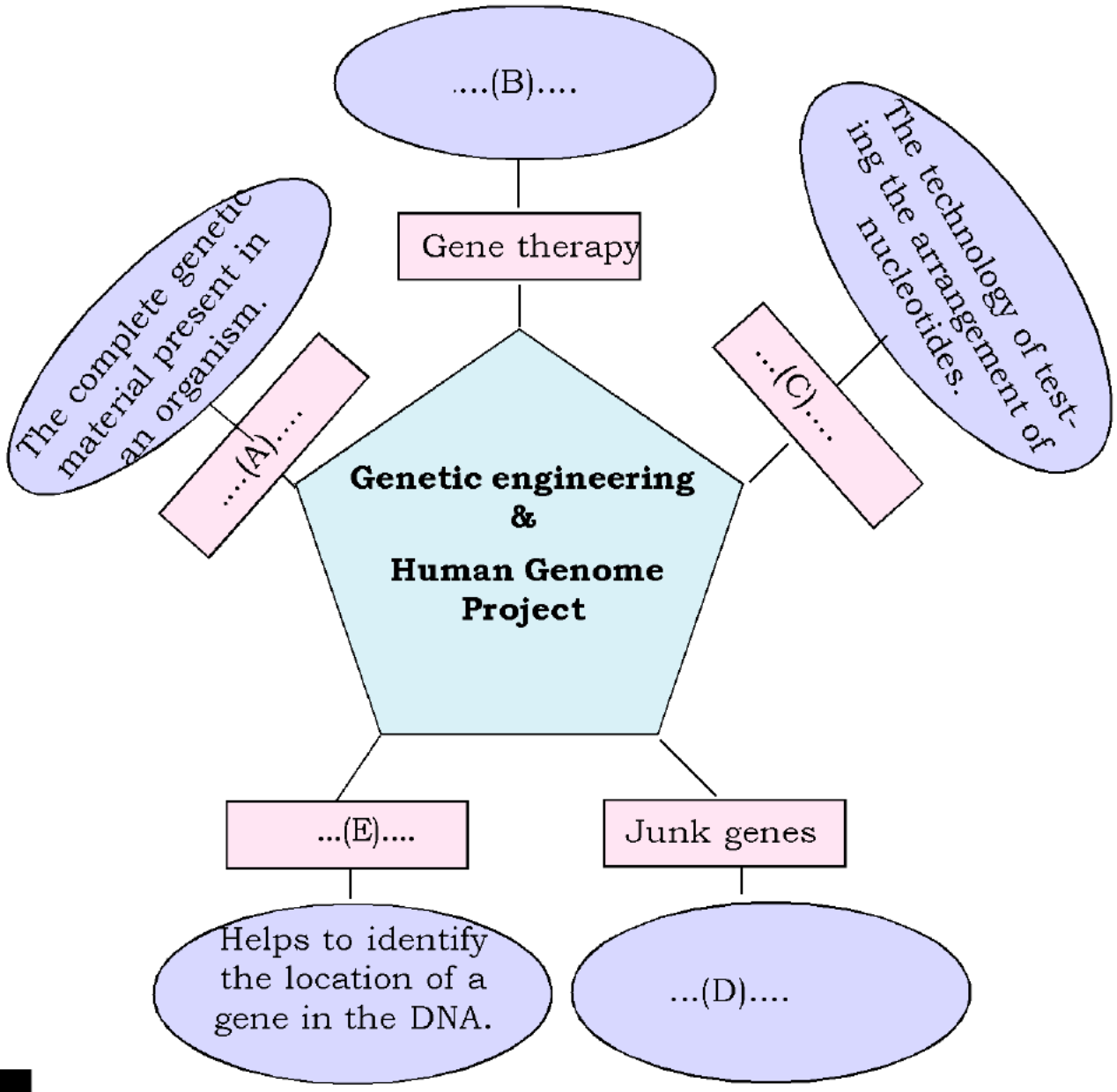
(a) Name the technology mentioned here.

(b) What is the basis of this technology?

(c) Some terms related to this technology is given in the box. Make suitable pairs.

Plasmid, Genetic glue, Vector, Restriction endonuclease, Genetic scissors, Ligase

3. An illustration related to Genetic engineering is given below.



(i) Complete the illustration.

(ii) What are the findings of Human Genome Project?

4. Make suitable pairs.

(Hint : Protein required for treatment - Disease/Symptom)

Diabetes, Growth disorders, Interferons, Endorphin, Viral diseases, Insulin, Pain, Somatotropin

5. Analyse the statement and answer the questions given below.

Animals like cow, pig etc, can be transformed into animals that can produce insulin and growth hormones required for humans.

(a) In which name these animals known as?

(b) How these animals are transformed through genetic engineering?

(c) What are the advantages of using organisms such as cows and pigs in contrast to bacteria for the production of insulin?

(d) Genetic modification is implemented for the production of pest resistant plants. Name three such plants.

6. Observe the news and answer the questions given below.

The corpses were identified by the help of technology

Idukki : By the help of technology, the police could identify the dead bodies of the victims of Rajamala landslide.....

(a) Name the technology mentioned above.

(b) Who invented this technology.

(c) What is the basis of this technology?

(d) What are the other areas where this technology can be used?

7. What are the ideas that can be presented in a debate conducted by school science club related to the topic "Genetic engineering - Use and Misuse."

8 The Paths Traversed by Life

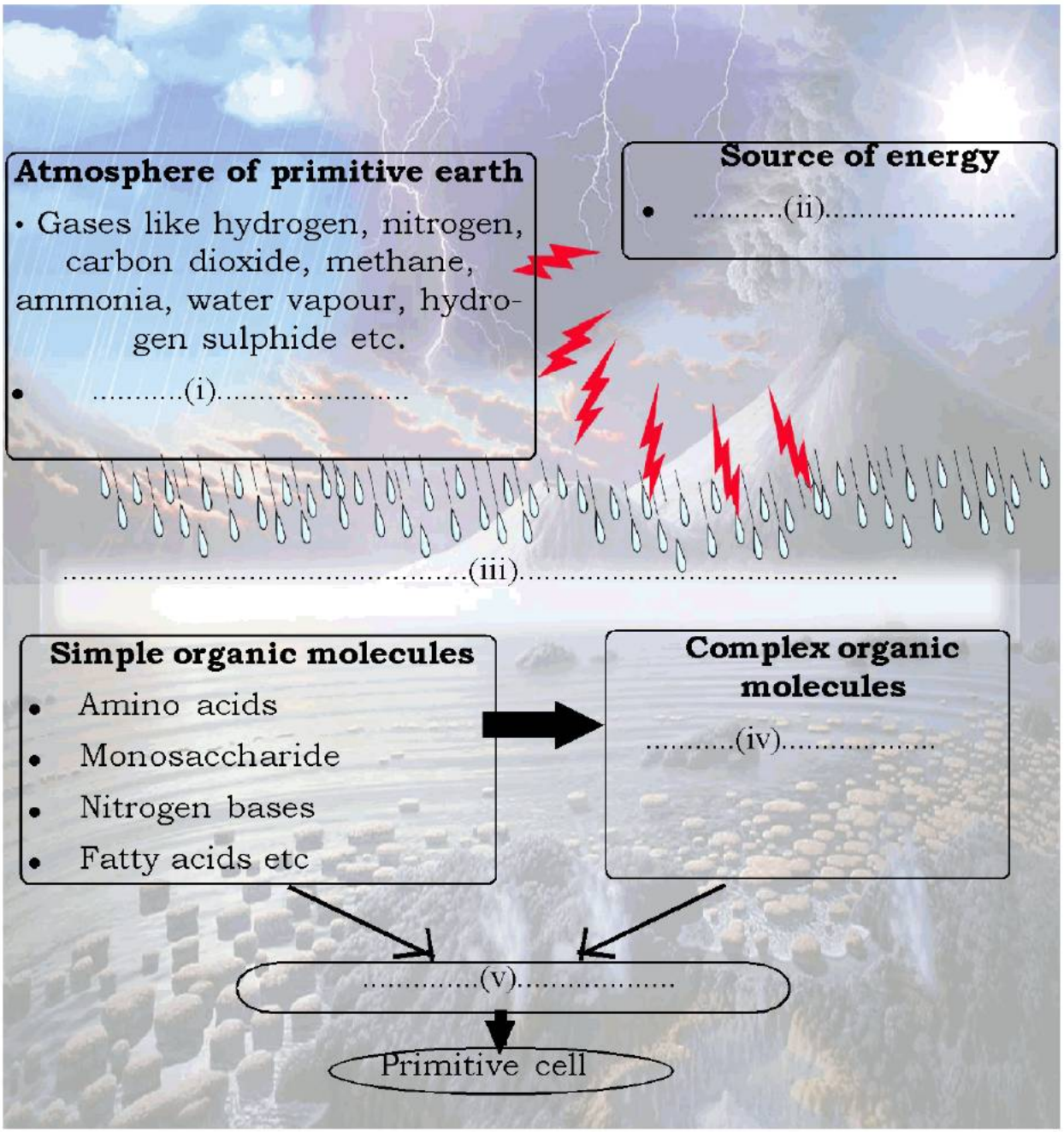
Main concepts

- The more predominant theory, on the origin of life on earth is the Chemical evolution theory.
- The Panspermia argues that life originated in some other planet in the universe and accidentally reached the earth.
- The hypothesis that evolved into the theory of chemical evolution is that life originated as a result of the changes that occurred in the chemical substances in seawater, under specific conditions in primitive earth.
- The Russian scientist A.I. Oparin (1924) and the British scientist J.B.S.Haldane (1929) are the proponents of Chemical evolution theory.
- Urey and Miller conducted their experiment by artificially recreating the atmosphere of primitive earth that contained methane, ammonia, hydrogen and water vapour.
- Life emerged in primitive earth as a result of the accidental combining of inorganic molecules. Changes occured over millions of years in primitive cell, prokaryotes, eukaryotes, colony of eukaryotes and multicellular organisms were evolved.
- The characters developed during the life time of organisms are called acquired characters.
- Lamarck explained that acquired characters accumulate through generations and lead to the formation of new species.
- A logical scientific theory on evolution was first put forward by Charles Robert Darwin, an English naturalist on the basis of the studies conducted on finches in Galapagos Islands.
- Charles Robert Darwin presented his theory (The theory of Natural selection) in the renowned text *Origin of Species by Means of Natural Selection* and that broke off many existing beliefs got great acceptance in the scientific world.

- Darwinism was revised in the light of new information from the fields of genetics, cytology, geology and paleontology. This modified version of Darwinism is known as Neo Darwinism.
- Mutation theory was formulated by a Dutch scientist, Hugo deVries.
- Paleontology, comparative morphology, physiology and modern molecular biology provide evidences to validate evolution.
- Fossils are the remnants of primitive organisms.
- The oldest known fossils dating from about 3.5 billion years ago are of prokaryotes.
- Organs that are similar in structure and perform different functions are called homologous organs.
- Through a comparative study of protein molecules in different species, the evolutionary relationship among organisms can be identified.
- Molecular studies is an effective method to illustrate the branching pattern of evolution from a common ancestor.
- Humans, chimpanzee, gorilla, orangutan, gibbon and monkeys are included in the category Anthropoidea.
- Anthropoidea is further classified into Cercopithecoidea and Hominoidea.
- Cercopithecoidea - The group of animals having small brain and long tail.
- Monkeys belong to Cercopithecoidea group.
- Hominoidea - The group of animals having developed brain and freely movable hands.
- Ardipithecus ramidus - The most primitive member of the human race.
- Homo neanderthalensis - Contemporary to modern man.
- Homo sapiens - Modern man.
- Biodiversity is on a dangerous decline due to the interference of human beings.
- Human life is possible on earth only with the preservation of other diverse ecosystems.

WORKSHEETS

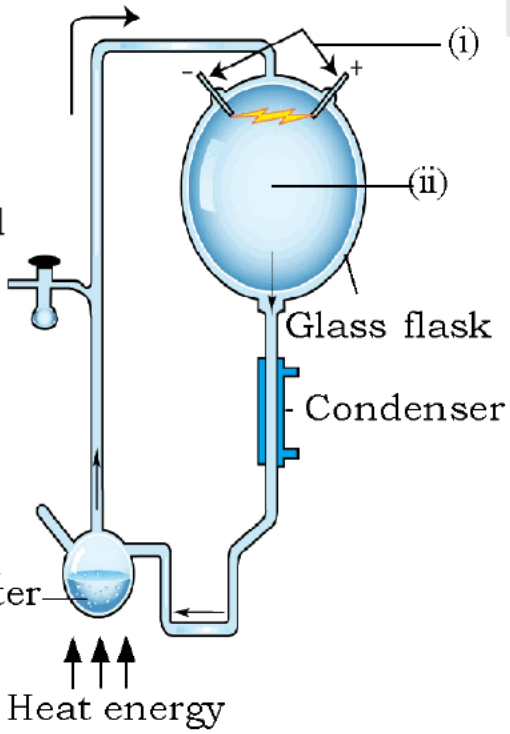
1. Observe the illustration related to chemical evolution and answer the questions given below.



(a) Complete the illustration.

(b) Who are the proponents of this theory?

2. An experimental set up to prove chemical evolution theory is illustrated below. Observe the illustration and answer the questions given below.



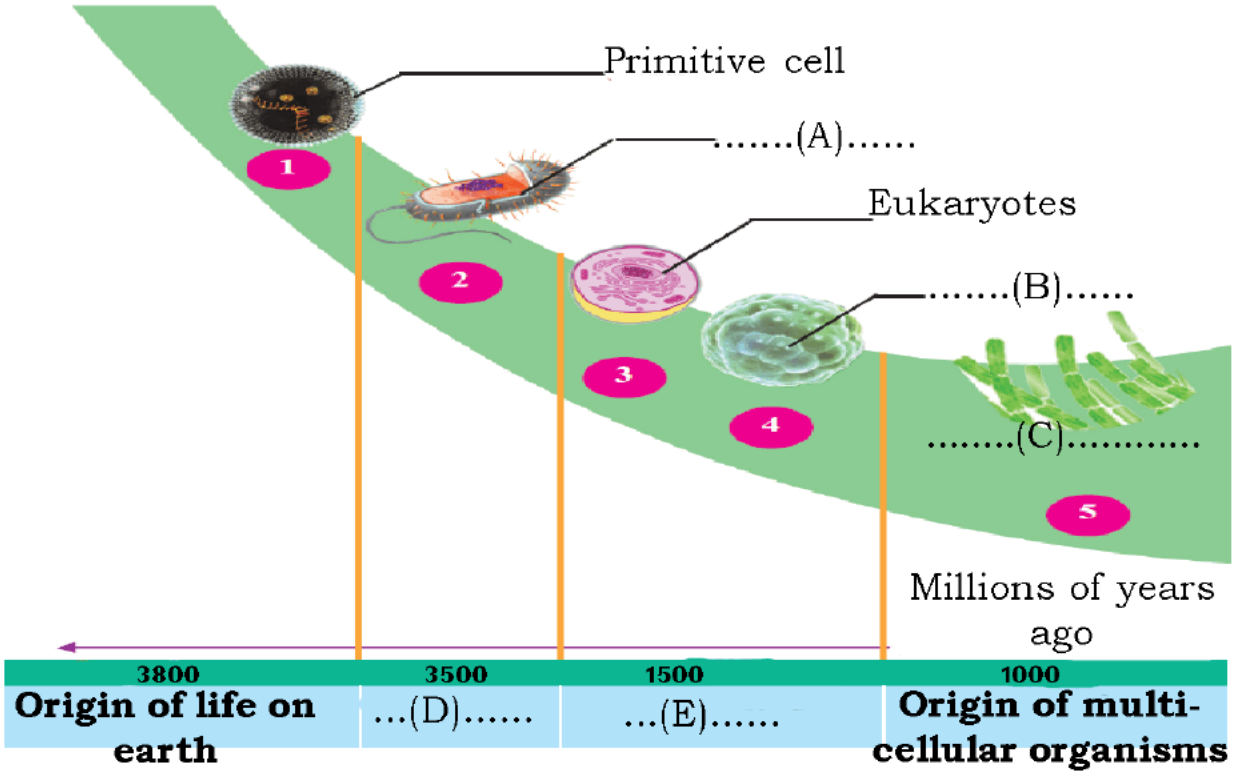
(a) Name the scientists who conducted this experiment?

(b) Complete the illustration.

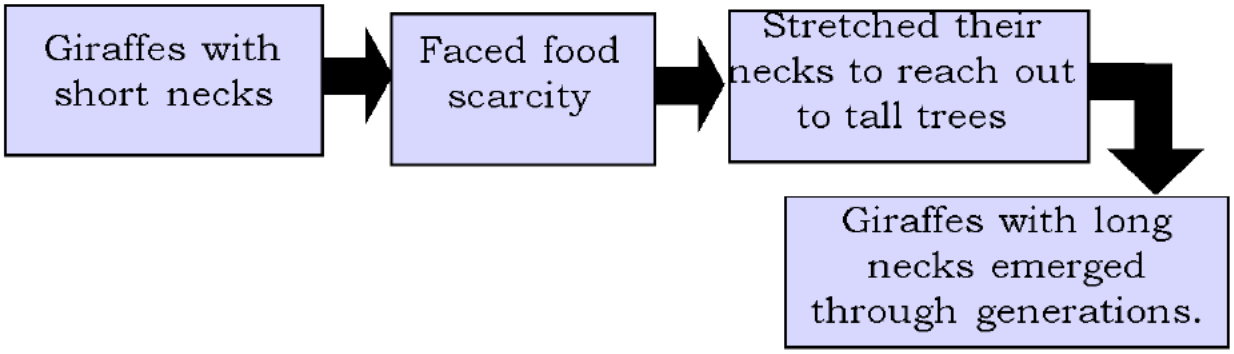
(c) Name the organic molecules formed through this experiment.

(d) How does this experiment justify the chemical evolution theory?

3. The major events related to the origin of life as illustrated in the geological time scale is given below. Complete the illustration.



4. An argument related to the history of evolution of organisms is given as a flowchart. Observe the flow chart and answer the questions given below.

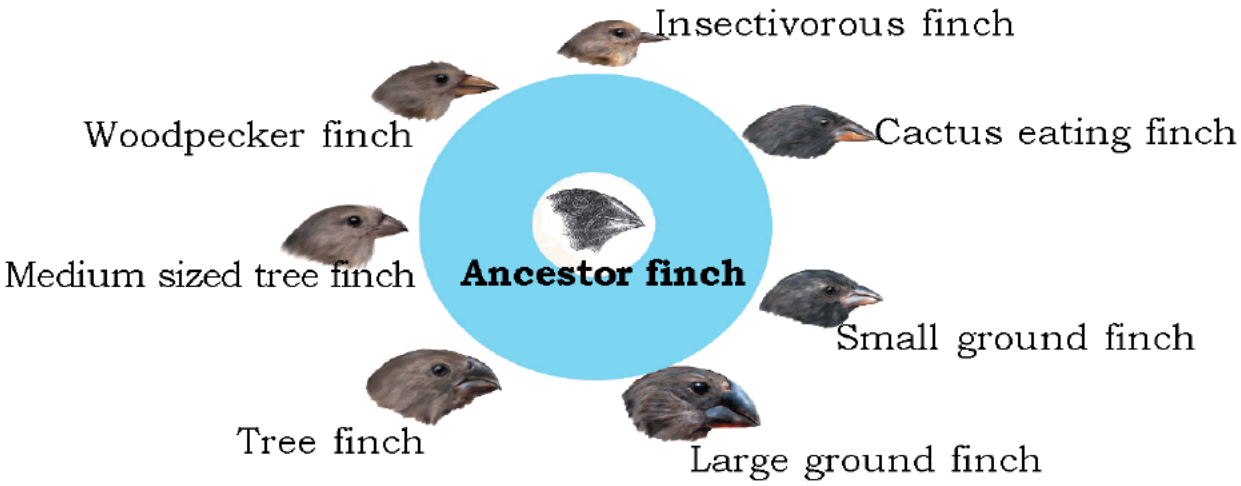


(a) Who proposed this argument?

(b) Which idea is explained through this argument?

(c) This argument was not accepted by the scientific world. Why?

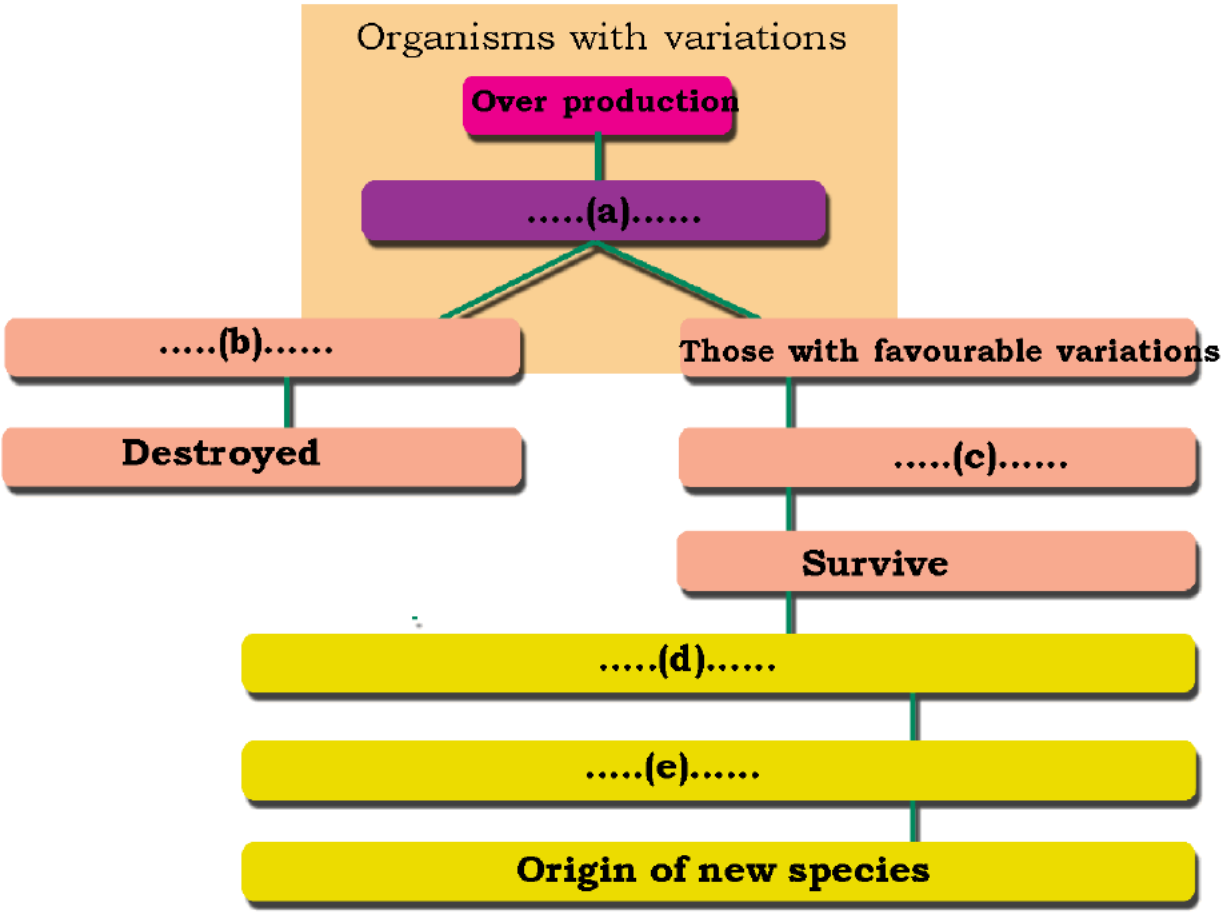
5. Observe the illustration and answer the questions given below.



(a) Name the scientist who closely studied the peculiarity of beaks in finches? In which island he conducted his studies?

(b) How does the peculiarity of beaks help finches in their survival?

6. Complete the illustration showing the theory of Natural selection.



7. Arrange column B with column A.

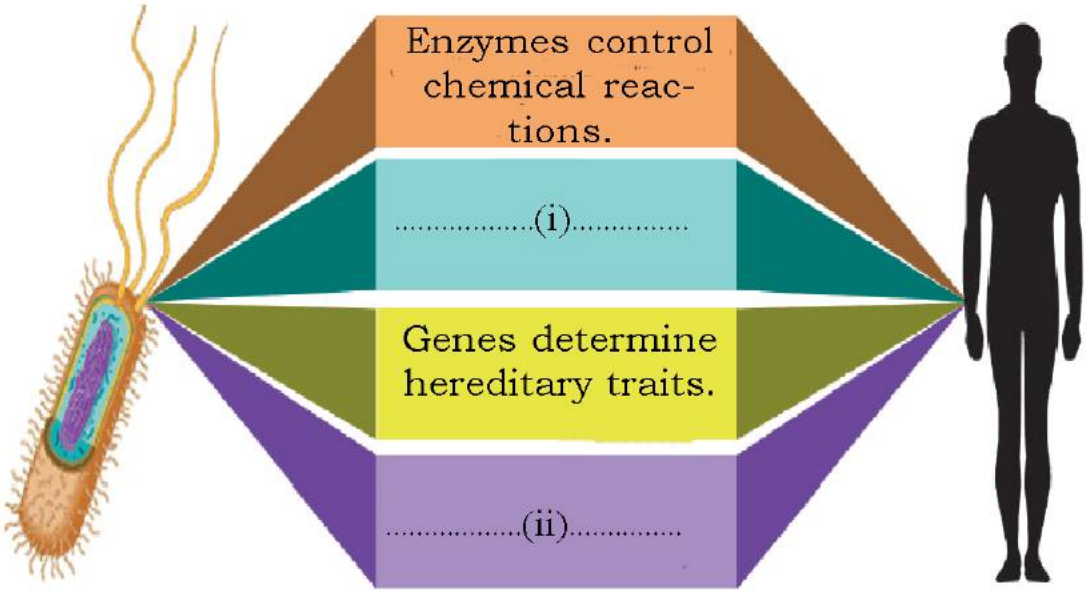
A	B
Stanley Miller, Harold Urey	Formulated Mutation theory.
Robert Malthus	Conducted the experiment by artificially recreating the atmosphere of primitive earth.
Charles Robert Darwin	Proponents of chemical evolution theory.
Oparin, Haldane	Scarcity of food led to diseases, starvation and struggle for existence.
Hugo deVries	Origin of Species by Means of Natural Selection.

8. Observe the illustration related to the structure of fore-limbs in lizard, bat, whale and answer the questions given below.

(a) Name the organs that are similar in structure and perform different functions.

(b) How this illustration justify evolution?

9. Observe the illustration related to the evidences of evolution and answer the questions given below.



(a) Complete the illustration.

(b) What proof of evolution do you get from these facts?

10. Observe the table and answer the questions given below.

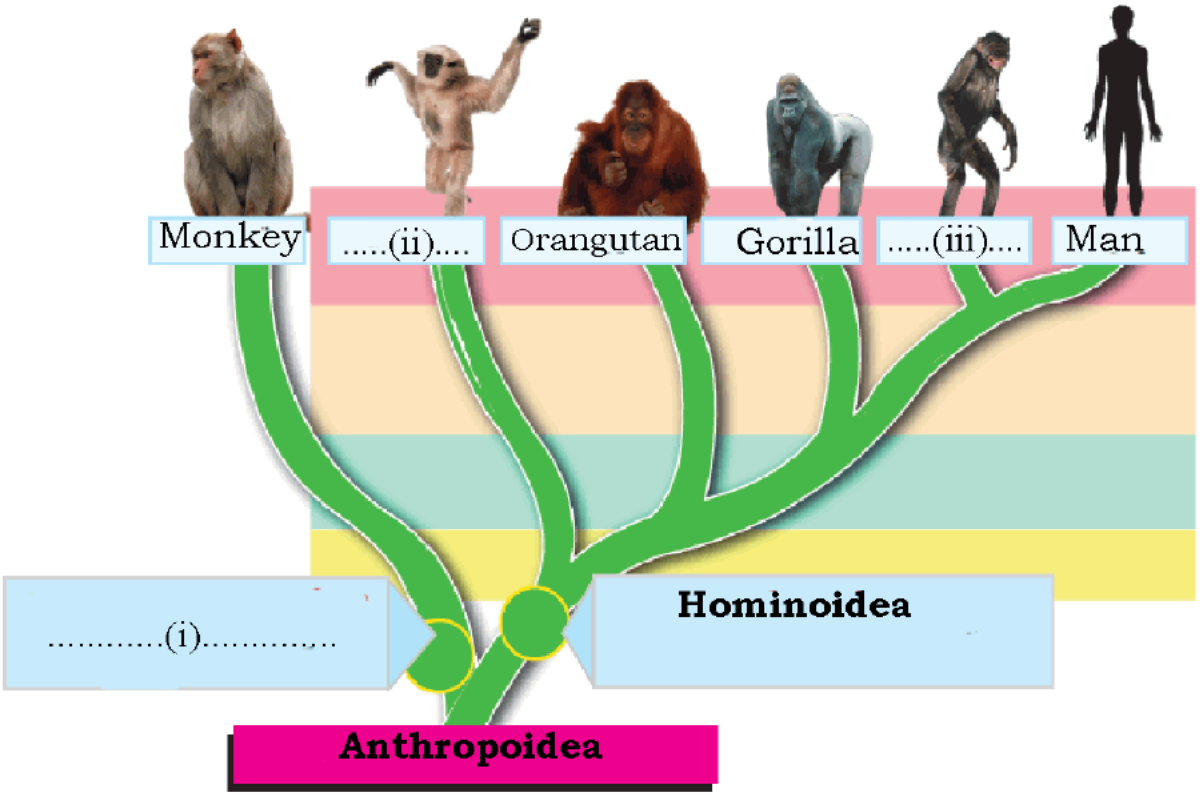
Organism	Difference from the amino acids in the β chain of haemoglobin in man
Chimpanzee	no change
Gorilla	difference of one amino acid.
Rat	difference of 31 amino acids.

(a) Which organism is the closest to man from the evolutionary point of view?

(b) What causes changes in amino acids in the β chain of haemoglobin?

(c) What is the advantage of this comparative study?

11. Observe the illustration of evolutionary tree relating to certain organisms and answer the questions given below.



(a) Complete the illustration.

(b) Which organism is the closest to humans in specific characters?

(c) What are the characteristics of the organisms which belong to the group hominoidea?

(d) "Man evolved from monkeys". How would you respond to this statement?

12. Members in the evolutionary history of modern man is given in the box. Select the answer of the following statements from the box.

Ardipithecus ramidus, Australopithecus afarensis, Homo habilis, Homo erectus, Homo neanderthalensis, Homo sapiens

(a) Modern man.

(b) The most primitive member of the human race.

(c) Contemporary to modern man.

(d) Made weapons from stones and bone pieces.

(e) Slender body.

(f) Thick chin and large teeth, had the ability to stand erect.

5 Soldiers of Defense

1. (a) (iii)

   (b) Prevent the entry of germs, prevent the transmission of germs to others and avoid dust particles in reaching the lungs.

2. (a) (i) Skin (ii) Mucous membrane

   (b) Coverings of the body act as a habitat for many useful bacteria. The germs that enter the body need to compete with such useful bacteria for shelter and nutrients. A great number of germs get destroyed in this competition.

   (c) (a) Epidermis

   (b) A protein called keratin present here prevents the entry of germs.

   (c) Sebaceous gland.

   (d) Sebum produced by the gland makes the skin oily and water proof.

   (e) Sweat gland.

   (f) The disinfectants present in the sweat produced by this gland destroys the germs.

   (d) Pathogens trapped in the mucus produced by this membrane, get destroyed. The destroyed germs are expelled out by the cilia cells of the mucous membrane.

3. (a) Lysozyme in tears

   (b) Mucus in nose

   (c) Mucus in trachea

   (d) HCl in stomach

   (e) Lysozyme in urine

4. (a) Basophil (b) Lymphocyte (c) Monocyte (d) Neutrophil (e) Eosinophil

5. (b) Lymphocyte identifies and destroys germs specifically.

   (c) Basophil dilates the blood vessels.

   (e) Neutrophil synthesizes chemicals that destroy bacteria.

   (i) Monocytes and neutrophils are phagocytes.

   (j) Eosinophil synthesizes chemicals that destroy foreign bodies.

   (k) Monocyte engulfs and destroys germs.

6. (a) Phagocytosis

   (b) The white blood cells, namely monocytes and neutrophils are phagocytes.

   (c) (i) Engulfs pathogen in the membrane sac. (ii) Lysosome combines with membrane sac. (iii) The pathogens are degenerated and destroyed by the enzymes in lysosome.

   (d) In an inflammatory response the capillaries dilate and thereby increasing the blood flow. Blood plasma and more white blood cells reach the wound site. Neutrophils and monocytes engulf and destroy germs.

   (e) (iv) Germs enter through wounds.

   (iii) The cells that get damaged by a wound or by an infection produce certain chemical substances.

   (i) Blood capillaries dilate.

   (v) White blood cells reach the wound site through the walls of the capillaries.

   (ii) Neutrophils and monocytes engulf and destroy germs.

7. (a) Thromboplastin (b) Prothrombin in plasma (c) Thromboplastin

   (d) Fibrin fibres (e) The red blood cells and platelets.

8. (a) I agree with the statement. The rise in body temperature reduces the rate of multiplication of pathogens.

   (b) The normal body temperature is 37^0C (98.6^0F).

   (c) When infection becomes uncontrollable, the body temperature may rise tremendously. We take medicines to reduce the body temperature. But it is advisable to treat

after diagnosing the exact reason. If the rise in body temperature persists for a long time, it may badly affect the internal organs including the brain. Hence, if fever increases, it is necessary to seek medical assistance immediately.

(d) (i)The presence of toxins produced by the pathogens stimulates the white blood cells.(ii) The chemical substances produced by the white blood cells raises the body temperature. (iii) The rise in body temperature reduces the rate of multiplication of pathogens.

9. (a) Destroy the bacteria by disintegrating their cell membrane.- B

(b) Mature in the bone marrow.- B

(c) Destroy the cells affected by virus.- T

(d) Destroy the pathogens by stimulating other white blood cells.- B

(e) Destroy cancer cells.- T

(f) Mature in the thymus gland.- T

(g) Stimulate other defense cells of the body.- T

(h) Neutralise the toxin of the antigens.- B

10. (a),(b),(c) - Phagocytosis, Inflammatory response, Blood clotting.

11. (a) A - Spleen B - Lymph node

(b) Lymph. The lymph, formed from the blood and reabsorbed into blood has a prominent role in defense mechanisms, like the blood itself. Lymph contains plenty of lymphocytes. They destroy the disease causing bacteria in lymph nodes and spleen.

12. (a) Vaccines are the substances used for artificial immunization.

(b) Any one of the components from alive or dead or neutralised germs, neutralised toxins or cellular parts of the pathogens will be the component of each vaccine. These act as antigens that stimulate the defense mechanism of the body. Antibodies are formed in the body against them. These antibodies are retained in the body which in future pro-

tects the body from the pathogen responsible for the same disease.

(c) Main ideas of poster - Immunization, Different vaccines, Importance of vaccination.

(d) B.C.G. - Tuberculosis
O.P.V. - Polio
Pentavalent - Diphtheria, tetanus, pertussis, hepatitis B and haemophilus influenzae type b
M.M.R. - Measles, mumps, and rubella
T.T - Tetanus

13. (a) Stethescope

(b) To record electric waves in the brain.

(c) Measuring blood pressure.

(d) Ultra Sound Scanner

(e) To get three-dimensional visuals of internal organs.

(f) Electro Cardio Gram

(g) To get three-dimensional visuals of internal organs with the help of computer, using X-rays.

(h) Measuring body temperature.

14. Cardiology - Treatment of heart
Ophthalmology - Treatment of eye
Neurology - Treatment of disorders of the nervous system.
Oncology - Cancer treatment
E.N.T - Treatment of ear, nose, and throat disorders.

15. (a) Medicines that are extracted from microorganisms like bacteria, fungi, etc. and used to destroy bacteria are called antibiotics.

(b) It was Alexander Fleming who first discovered antibiotics in 1928.

(c) (i), (ii) Regular use develops immunity in pathogens against antibiotics, Reduces the quantity of some vitamins in the body.

16. • People in the age group 18-60 can donate blood.

• Blood donation causes no problem to the donor's health.

• Pregnant women and breast feeding mothers should not

donate blood.

- Persons with communicable diseases (transmitted through blood) should not donate blood.

17. (a) The basis of blood grouping is the presence of antigen A and antigen B in red blood cells.

(d) The blood group of a person is named according to the antigen present in that person's blood.

(f) Antigens are absent in the blood group O.

(h) In blood transfusion, certain antibodies present in the blood plasma are of special importance.

(i) In blood group A, antibody b and in group B, antibody a are present.

18. I do not agree with the statement. The person with blood group **A** can not receive blood from a person with blood group **B**.

When a foreign antigen reaches one's blood, it stimulates the defense mechanism. On receiving unmatching blood, the antigen present in the donor's blood and the antibody present in the recipient's blood will react with each other and form a blood clot. Hence, everyone cannot receive blood from all blood groups.

For example in blood group A, antigen A and in group B, antigen B are present. If a person with blood group A receives blood from a person with B group blood, the recipient's blood does not contain B antigen. So it stimulates defense activity of the body. As a result, antigen B in blood group B forms a clot with antibody 'b' of A group blood.

19. (a) Prevents the entry of germs through leaves.

(b) Bark

(c) Provide rigidity to the cell wall.

(d) The germs that have crossed the cell wall are prevented from entering through the cell membrane.

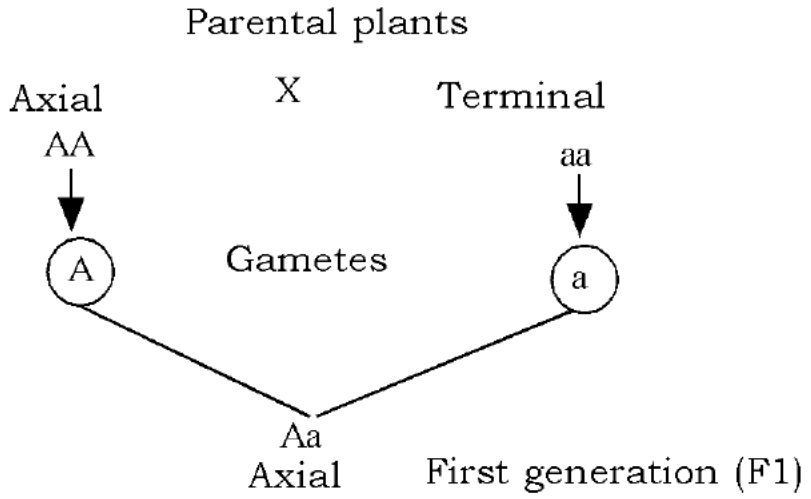
6 Unravelling Genetic Mysteries

1. (a) Dominant trait - Axial, Recessive trait - Terminal

   (b) A character is controlled by the combination of two factors. One trait is expressed (dominant trait) and the other trait remains hidden (recessive trait) in the offsprings of the first generation.

   (c) Axial and terminal in the ratio 3:1.

   (d)



   (e) (i) Aa (ii) Axial (iii) a (iv) A (v) AA (vi) Aa (vii) aa (viii) Axial

   (f) During gamete formation the factors that determine a particular character segregate without getting mixed; ie., half of the gametes formed from first generation plant Aa, contain A and the other half contain a.

2. (a) (i) TTRR (ii) Dwarf plant, Wrinkled Seed (iii) tr (iv) Tall plant, Round seed

   (b) Tall plant, Round seed.

   Dwarf plant, Round seed

   Tall plant, Wrinkled Seed

   Dwarf plant, Wrinkled Seed

   (c) (i) TtRR - Tall plant, Round seed.

   (ii) TtRr -Tall plant, Round seed.

   (iii) TTRR - Tall plant, Round seed.

(iv) ttrr - Dwarf plant, Wrinkled Seed

(v) TTrr - Tall plant, Wrinkled Seed

(vi) ttRR - Dwarf plant, Round seed

(d) Dwarf plant, Round seed

Tall plant, Wrinkled Seed

Mendel explained that the appearance of variations in off-springs (characters not present in previous generation) is due to the independent assortment of each character.

3. (a) Two scientists, James Watson and Francis Crick, presented the double helical model of DNA in 1953. As per the double helical model, DNA molecule contains two strands. A structure with two long strands made up of sugar and phosphate, and rungs with nitrogen bases, was suggested.

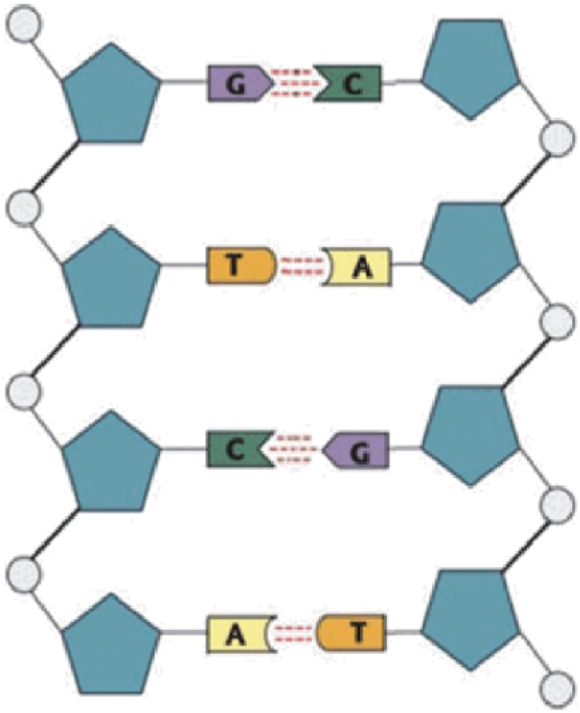
(b) Nucleotide

(c) DNA molecule is made up of units called nucleotides. A nucleotide contains a sugar molecule, a phosphate molecule and a nitrogen base.

(d) (ii) Sugar molecule/Deoxyribose sugar (iii)Phosphate molecule

(e) Nitrogen bases. Nitrogen bases are molecules that contain nitrogen and are alkaline in nature.

(f)



4. DNA - (a) Two stranded.(b) Contains deoxyribose sugar.(d) Deoxyribonucleic Acid. (f) Has four kinds of nitrogen bases,

namely adenine, thymine, guanine and cytosine.

RNA - (c) Has four kinds of nitrogen bases, namely adenine, uracil, guanine and cytosine.(e) Single stranded. (g) Ribonucleic Acid (h) Contains ribose sugar.

5. (f) mRNA forms from DNA.

   (e) mRNA reaches outside the nucleus.

   (b) mRNA reaches ribosome.

   (d) tRNA brings different kinds of amino acids to ribosome.

   (a) Based on the information in mRNA, amino acids are added.

   (c) Protein is synthesized.

6. (b) There are 46 chromosomes in human beings.

   (c) Sex chromosomes are of two types.

   (f) The genetic makeup of male is 44 + XY.

7. (a) Crossing over in Chromosomes

   (b) As a result of crossing over of chromosomes, part of a DNA crosses over to become the part of another DNA. This causes a difference in the distribution of genes. When these chromosomes are transferred to the next generation, it causes the expression of new characters in offsprings.

   (c) Combination of Allele during fertilization - The chromosomes of parents reach the offsprings through gametes. When gametes undergo fusion, the combination of allele changes. This causes the expression of characteristics in offsprings that are different from parents. Thus, fertilization causes variations in the next generation.

OR

Mutation - A sudden heritable change in the genetic constitution of an organism is called mutation. Mutations bring about changes in genes which can be transmitted over generations and thus leading to variations in characters. Mutations have great relevance in evolution.

8. (a) (i) XX (ii) Y (iii) X (iv) XX (v) Girl (vi) XY (vii) Boy (viii) XY

   (b) Equal. 1Boy : 1 Girl

   (c) I agree with this statement. The XY chromosomes of the father determine whether the child is male or female. Child with XX sex chromosomes is female and one with XY sex chromosomes is male.

7 Genetics of the Future

1. (a) Human cell (b) Circular DNA of the bacterium(Plasmid). (c) Cutting of insulin gene. (d) Joining insulin gene with plasmid. (e) Bacteria that multiply in the culture medium produce inactive insulin.(f) Active insulin is produced from this.

2. (a) Genetic Engineering.

   (b) The basis of this is the discovery of the fact that genes can be cut and joined.

   (c) Vector - Plasmid,Genetic scissors - Restriction endonuclease, Genetic glue - Ligase

3. (i) A - Genome

   B - Is a method of treatment in which the genes that are responsible for diseases are removed and normal functional genes are inserted in their place.

   C - DNA profiling

   D - In human DNA, majority of genes, except the genes that code for protein are non-functional.

   E - Genemapping

   (ii)
   - Human genome has about 24000 functional genes.
   - Major share of human DNA includes junk genes.
   - There is only 0.2 percent difference in DNA among humans.
   - About 200 genes in human genome are identical to those in bacteria.

4. Interferons - Viral diseases

   Insulin - Diabetes

   Endorphin - Pain

   Somatotropin - Growth disorders

5. (a) Pharm animals.

   (b) Genes responsible for the production of insulin and growth hormones required for humans are inserted into animals like cow, pig etc, transforming them into pharm animals.

(c) There are certain limitations in producing insulin using bacteria. The most important hurdle in this field is the culturing of bacteria. Researches in this field show that instead of this, medicines can be extracted from the blood or milk of genetically modified animals.

(d) Bt brinjal, Bt soyabean, Bt cotton

6. (a) DNA Finger printing

(b) Alec Jeffreys

(c) Just like the difference in the fingerprint of each person, the arrangement of nucleotides in each person also differs. This discovery became the basis of DNA testing. Hence this technology is also called DNA finger printing.

(d) The arrangement of nucleotides among close relatives has many similarities. Hence, DNA finger printing is helpful to find out hereditary characteristics, to identify real parents in cases of parental dispute and to identify persons found after long periods of missing due to natural calamities or wars.

DNA of the skin, hair, nail, blood and other body fluids obtained from the place of murder, robbery etc., is compared with the DNA of suspected persons. Thus, the real culprit can be identified from among the suspected persons through this method.

7. Scope of genetic engineering - Gene therapy, Genetically modified animals and crops, Forensic test.

Misuse of genetic engineering

- Threat to indigenous varieties - It is criticized that genetically modified varieties cause harm to indigenous varieties and may cause health issues to humans.
- Bioweapons - Application of genetically modified pathogens and pathogens multiplied through biotechnology upon enemies is called biowar. This becomes a threat to the existence of human beings.
- Genetic modification - Certain organizations argue that genetic modification is an intrusion upon the freedom of living beings and it is a violation of rights.

8 The Paths Traversed by Life

1. (a) (i) No free oxygen.
   (ii) Thunder and lightning, Ultraviolet radiations, Volcanic eruptions.
   (iii) Condensation of water vapour present in the atmosphere and the resulting incessant rain led to the formation of oceans.
   (iv) Protein, Polysaccharide, Nucleotides, Lipids etc
   (v) Nucleic acids, lipid layer.
   (b) The Russian scientist A.I. Oparin (1924) and the British scientist J.B.S.Haldane (1929) are the proponents of this theory.
2. (a) Stanley Miller, Harold Urey
   (b) (i) Electric energy (ii) Methane, ammonia, water vapour.
   (c) Amino acids
   (d) The hypothesis that evolved into the theory of chemical evolution is that life originated as a result of the changes that occurred in the chemical substances in seawater, under specific conditions in primitive earth. This was proved by this experiment, by synthesizing amino acids in the laboratory by recreating the conditions in primitive earth.
3. (A) Prokaryotes
   (B) Colony of eukaryotes
   (C) Multicellular organisms
   (D) Origin of prokaryotes
   (E) Origin of eukaryotes
4. (a) Jean Baptist Lamarck, a French biologist.
   (b) The characters developed during the life time of organisms are called acquired characters. Lamarck explained that these characters accumulate through generations and lead to the formation of new species.
   (c) This argument was not accepted by the scientific world as these acquired characters are not inheritable.

5. (a) Charles Darwin, Galapagos Islands.

   (b) Insectivorous finches have small beaks and those that feed on cactus plants have long and sharp beaks. There were also woodpecker finches that used sharp beaks to pick small twigs for feeding on worms from the holes in tree trunks. The ground finches that feed on seeds with large beaks were also present.

6. (a) Struggle for existence

   (b) Those with no favourable variations

   (c) Natural selection

   (d) Favourable variations are transferred to the next generation.

   (e) Accumulation of variations inherited through generations.

7. Stanley Miller, Harold Urey - Conducted the experiment by artificially recreating the atmosphere of primitive earth.

   Robert Malthus - Scarcity of food led to diseases, starvation and struggle for existence. .

   Charles Robert Darwin - Origin of Species by Means of Natural Selection.

   Oparin, Haldane - Proponents of chemical evolution theory.
   Hugo deVries - Formulated Mutation theory.

8. (a) Organs that are similar in structure and perform different functions are called homologous organs.

   (b) Anatomical resemblances justify the inference that all organisms evolved from a common ancestor.

9. (a) (i) Energy is stored in ATP molecules.

   (ii) Carbohydrates, proteins and fats are the basic substances.

   (b) It is clear from these facts that different species that exist today have a common ancestor.

10. (a) Chimpanzee

   (b) Mutations may occur in the genes that determine the amino acid sequence in protein molecules. This causes changes in amino acids.

   (c) Through a comparative study of protein molecules in different species, the evolutionary relationship among organ-

isms can be identified. This is an effective method to illustrate the branching pattern of evolution from a common ancestor.These kinds of molecular studies help to find out the evolutionary relationship of different species of organisms.

11. (a) (i) Cercopithecoidea (ii) Gibbon (iii) Chimpanzee

(b) Chimpanzee

(c) Developed brain, freely movable hands.

(d) The statement is wrong. Though man and monkey belong to the common group anthropoidea, man is a member of the group hominoidea and monkey belongs to the group cercopithecoidea. Developed brain, freely movable hands are the characteristics of the organisms which belong to the group hominoidea. Small brain, long tail are the characteristics of the organisms which belong to the group cercopithecoidea.

12. (a) Homo sapiens

(b) Ardipithecus ramidus

(c) Homo neanderthalensis

(d) Homo habilis

(e) Australopithecus afarensis

(f) Homo erectus