

## Heredity and Evolution NCERT Solutions

**Q1.** A Mendelian experiment consisted of breeding tall pea plants bearing violet flowers with short pea plants bearing white flowers. The progeny all bore violet flowers, but almost half of them were short. This suggests that the genetic make-up of the tall parent can be depicted as

- (a) TTWw (b) TT  
(c) TtWw (d) TtWw

**Ans.** (c) TtWw

**Q2.** An example of homologous organs is

- (a) our arm and a dog's fore-leg.  
(b) our teeth and an elephant's tusks.  
(c) potato and runners of grass.  
(d) all of the above,

**Ans.** (d) all of the above.

**Q3.** In evolutionary terms, we have more in common with

- (a) a Chinese school-boy. (b) a chimpanzee.  
(c) a spider, (d) a bacterium.

**Ans.** (a) a Chinese school-boy

**Q4.** A study found that children with light-coloured eyes are likely to have parents with light-coloured eyes. On this basis, can we say anything about whether the light eye colour trait is dominant or recessive? Why or why not?

**Ans.** No, we cannot say that the trait is recessive or dominant because we do not know the nature of the two variants of a trait.

**Q5.** How are the areas of study—evolution and classification—interlinked?

**Ans.** For classification of organisms we generally group the organisms of same characteristics together and those with different characteristics are grouped or classified separately. A set of characteristics tells about the level of evolution of an organism.

**Q6.** Explain the terms analogous and homologous organs with examples.

**Ans.** Analogous organs—Organs with different structure and same function e.g., wings of bird, insects. Homologous organs—Organs which have same structure but different functions are called homologous organs e.g., forearm of lizard, bird and human.

**Q7.** Outline a project which aims to find the dominant coat colour in dogs.

**Ans.** Dominant → WW (white colour)

	w	w
White colour	W	Ww
	W	Ww

F<sub>1</sub> generation—all white dogs

Ww                  Ww  
Male                  female

F<sub>2</sub> generation

WW	}	White	ww
Ww			
Ww			
			black

3 : 1

**Q8.** Explain the importance of fossils in deciding evolutionary relationships.

**Ans.** Fossils help us to know the following:

- (a) Fossils help to trace the racial history of organisms.  
(b) They help to measure the geological time,  
(c) Older fossils lie at the depth and young fossils are at the upper surface of the earth.

Complex organisms are present at top and simple organisms are present at the bottom.

- (d) Fossil like—Archaeopteryx—show the link between two different types of species.

**Q9.** What evidence do we have for the origin of life from inanimation?

**Ans.** Miller and Urey in 1953 assembled an atmosphere similar to that thought to exist at early period (Gases like ammonia, methane, hydrogen sulphide) over earth. This was maintained at a temperature just below 100°C and sparks were passed through the mixture of gases to simulate

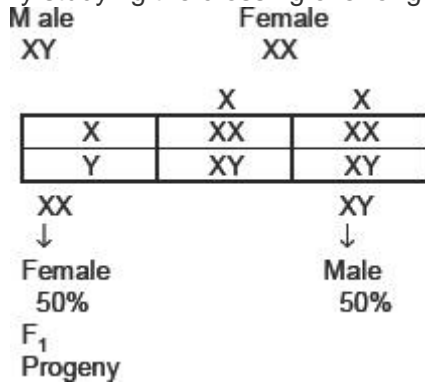
lighting. At the end of a week 15% of the carbon (from methane) had been converted to simple compounds of carbon including amino acids which make up protein molecules. Presence of protein cell membrane correlates with above experiment. This shows that life originated from inanimate matter.

**Q10.** Explain how sexual reproduction gives rise to more viable variations than asexual reproduction. How does this affect the evolution of those organisms that reproduce sexually?

**Ans.** Variations are seen more in sexual reproduction than asexual reproduction because variations occur due to change in DNA coding and due to sexual reproduction in which two genes from two different sexes i.e., male and female genes crossing over takes place and hence cause the variation.

**Q11.** How is the equal genetic contribution of male and female parents ensured in the progeny?

**Ans.** By studying the crossing over of genes of male sex and female sex is as follows:



**Q12.** Only variations that confer an advantage to an individual organism population. Do you agree with this statement? Why or why not?

**Ans.** No, depending on the nature of variations different individuals have different kinds of advantages. However, when a drastic change occurs in environment only those organism in the population will survive which have an advantageous variation in that population to survive in changed environment.

## How do organisms reproduce

**Q1.** Asexual reproduction takes place through budding in

- (a) amoeba      (b) yeast.      (c) plasmodium.      (d) leishmania.

**Ans.** (b) yeast

**Q2.** Which of the following is not a part of the female reproductive system in human beings?

- (a) Ovary      (b) Uterus      (c) Vas deferens      (d) Fallopian tube

**Ans.** (c) Vas deferens

**Q3.** The anther contains

- (a) sepals      (b) ovules      (c) carpel      (d) pollen grains

**Ans.** (d) pollen grains

**Q4.** What are the advantages of sexual reproduction over asexual reproduction?

**Ans.** In **asexual reproduction**, the offspring is almost identical to the parent because they have the same genes as their parent. Thus, variation is not present.

**Sexual reproduction** involves fusion of male and female gametes. The offspring exhibits diversity of characters because they receive some genes from the mother and some from the father. The mixing of genes in different combinations, results in genetic variations. This variation leads to the continuous evolution of various species to produce various organisms.

**Q5.** What are the functions performed by testis in human beings?

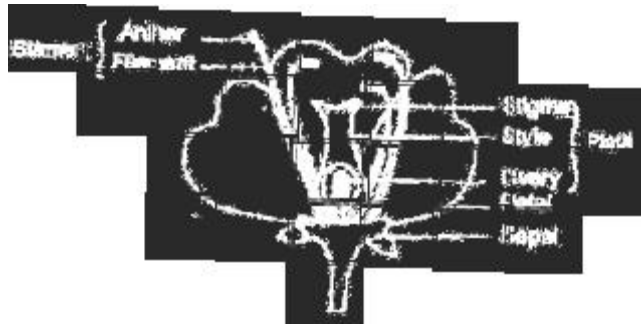
**Ans.** The function of testis is to produce sperms and male sex hormone called testosterone.

**Q6.** Why does menstruation occur?

**Ans.** Menstruation occurs in females when the egg produced inside the cervix is not fertilized.

Since the egg does not fuse with the male gamete, so the thick and soft lining of uterus having a lot of blood capillaries in it are not required. This unfertilized egg dies within a day and the lining breaks down shedding blood along with other tissues. This comes out of the vagina in the form of bleeding.

**Q7.** Draw a labelled diagram of the longitudinal section of a flower.



**Q8.** What are the different methods of contraception?

**Ans.** Contraception is the method to avoid pregnancy. Various methods of contraception are as follows:

**Physical Barrier Methods:** Use of condoms, diaphragms, cervical caps can be used. These prevent the entry of sperms into the female genital tract by acting as a barrier between them.

**Chemical Methods:** Oral pills can be used which change the hormonal balance and stop release of egg. Vaginal pills kill the sperms.

**Surgical Methods:** This includes vasectomy (sperm duct is removed) in males and tubectomy (removal of small portion of fallopian tube) in females.

**Q9.** How are modes of reproduction different in unicellular and multicellular organisms?

**Ans.** Unicellular organisms have only one cell. There is no separate tissue for reproduction. So, they can reproduce by the process of fission or budding. Multicellular organisms contain various cells and have separate system for reproduction. So, they can reproduce by both sexual and asexual methods.

**Q10.** How does reproduction help in providing stability to the population of species?

**Ans.** Stability is provided by equalizing the birth and death ratio. Thus, the rate of birth should approximately be equal to the rate of death.

**Q11.** What could be the reasons for adopting contraceptive methods?

**Ans.** The reasons for adopting contraceptive methods could be:

1. Protection from sexually transmitted diseases such as HIV-AIDS, gonorrhoea, syphilis, warts etc.
2. Restricting the number of children.
3. Sufficient gap between successive births.
4. Enjoying a good reproductive health.
5. Controlling population.

## Management of Natural Resources

**Q1.** What changes would you suggest in your home in order to be environment friendly?

**Ans.** The following changes can be made to be environment friendly:

- (i) Check the wastage of water, close the taps properly, recycle the water of washing machine into toilets.
- (ii) Stop the use of bulbs and switch over to CFL lights.
- (iii) Use solar water heater and cookers, install solar cell panel for electricity.
- (iv) Reduce the garbage by not throwing such items which can be reused and recycled.

**Q2.** Can you suggest some changes in your school which would make it environment-friendly?

**Ans.** (i) Recycle the waste paper thro e it instead of dumping it in garbage.

- (ii) Rain wafer hrvesting sys em should be made.
- (iii) Plant more and more frees.
- (iv) Make compost of bio-mass collected like food waste, fallen leaves etc.,

**Q3.** We saw in this chapter that there are four main stakeholders when it comes to forests and wildlife. Which among these should have the authority to decide the management of forest produce? Why do you think so?

**Ans.** The local people staying near the forest should be given the authority to decide the management of forest produce. They can keep a check on and control the misuse of the forest and its goods. They are the ones who do not exploit the forest and they know how to manage so it stays there for their for future generations to come.

**Q4.** How can you as an individual contribute or make a difference to the management of  
(a) forests and wildlife, (b) water resources and  
(c) coal and petroleum?

**Ans.** (a) Forests and wildlife: Use less paper, do not waste paper, as trees are cut down to make it. Do not buy any animal products which are made by killing them like fur, skin, tusk, horn etc.

(b) Water resources: Use buckets to take bath instead of shower. Recycle the water from washing machine for toilets use.

(c) Coal and petroleum: Use public transport or use the transport that uses CNG. Switch off lights, minimise the use of air-conditioner, room heater etc.

**Q5.** What can you as an individual do to reduce your consumption of the various natural resources?

**Ans.** By following 3 R's

(a) Reduce: Reduce or minimise the use of resources, by gaving electricity by switching off unnecessary lights. and fans etc. and by walking.whenever possible.

(b) Recyde: Collect and recycle the products like plastic, paper, glass and metal.

(c) Reuse: It is better than recycle. Instead of throwing used envelopes. We can reverse it and use it again. The plastic and glass containers, bottles can be reused.

**Q6.** List five things you have done over the last one week to:

(a) Conserve our natural resources.

(b) Increase the pressurre on our natural resources.

**Ans. (a) To conserve our natural resources:** I preferred walking to the nearby places or cycling instead of going by a car. Switched off lights when not required. Minimised the use of water and checked the extra flow of water.

**(b) Increase the pressure on our natural resources:** I used air conditioner. Shopped for new clothes.

**Ans.** To save various resources. I would follow 3R's reduce, reuse and recycle. Minimize the use of coal and petroleum switch over to CNG and use electrical equipments at the minimum.

Do not waste paper and water. I,will not buy goods made by killing animals like fur, leather, tusk, etc.

## Control and Coordination

1. Which of the following is the plant hormone?

(a) Insulin

(b) Thyroxine

(c) Oestrogen

(d) Cytokinin

**Ans.** (d) Cytokinin

2. The gap between two neurons is called a

(a) dendrite.

(b) synapse.

(c) axon

(d) impulse.

**Ans.** (b) synapse.

3. The brain is responsible for

(a) thinking.

(b) regulating the heart beat.

(c) balancing the body.

(d) all of the above.

**Ans.** (d) all of the above.

4. What is the function of receptors in our body? Think of situations where receptors do not work properly. What problems are likely to arise?

**Ans.** The receptors in our body collect information about changes in the environment around us in the form of stimuli. They are located in our sense organs such as the inner ear, nose, tongue, eye, etc.

These then pass the information in the form of nerve impulses to central nervous system (spinal cord and brain) where message is interpreted and instructions are sent to effectors which reveal responses.

When receptors do not work properly, the environmental stimuli are not able to create nerve impulses and body does not respond.

**5.** Draw the structure of a neuron and explain its function.

**Ans.** Functions: The information acquired at the end of the dendritic tip of a neuron sets off a chemical reaction which creates an electrical impulse. This impulse travels from the dendrite to the cell body, and then along the axon to its end. At the end of axon, the electrical impulse sets off the release of some chemicals, which cross the synapse and start a similar impulse in a dendrite of the next neuron.

In this way nervous impulses travel in the body. Thus, nervous tissue is made up of an organized network of neurons which are specialized for conducting information via electrical impulse from one part of the body to another.

**6.** How does phototropism occur in plants?

**Ans.** Movement of shoot towards light is called phototropism. This movement is caused due to more growth of cells towards the shaded side of the shoot as compared to the side of shoot towards light. More growth of cells is due to secretion of auxin towards the shaded side.

- Fill a conical flask with water.
- Cover the neck of the flask with a wire mesh.
- Keep two or three freshly germinated bean seeds on the wire mesh.
- Take a cardboard box which is open from one side.
- Keep the flask in the box in such a manner that the open side of the box faces the light coming from a window.
- After two or three days, you will notice that the shoots bend towards light and roots away from light.
- Now, turn the flask so that the shoots are away from light and the roots towards light.

Leave it undisturbed in this condition for a few days.

- The old parts of the roots and shoots change directions.
- New growth in shoot is in direction of sunlight.

**Conclusion:** Shoot shows phototropism.

**7.** Which signals will get disrupted in case of a spinal cord injury?

**Ans.** (a) Reflex action

(b) Impulses from various body parts will not be conducted to brain.

(c) Message from brain will not be conducted to various organs of the body.

**8.** How does chemical coordination occur in plants?

**Ans.** In plants, chemical coordination occurs with the help of plant hormones (phytohormones). Different plant hormones help to coordinate growth, development, and responses to the environment. They are synthesized at places away from where they act and diffuse to the area for action, for example, auxin promotes cell growth, gibberellins promote stem growth, cytokinins promote cell division and abscisic acid inhibits growth and its effects include wilting of leaves.

**9.** What is the need for a system of control and coordination in an organism?

**Ans.** The body of a multicellular organism consists of a number of components and sub-components and each is specialized to perform a particular function. Therefore, it is necessary that various organs of the body of an organism work together in a proper manner for proper functioning to a stimulus. In human beings nervous system and endocrine system work together to control and coordination.

**10.** How are involuntary action and reflex action different from each other?

**Ans.** (a) Involuntary action involves autonomic nervous system.

- (i) They occur in response to internal stimuli.
- (ii) They are connected with functioning of internal body parts.
- (iii) It occurs without the will of the organism. E.g., heartbeat, breathing, etc.
- (iv) These are regulated by medulla oblongata (hind brain).

(b) Reflex action involves all parts of voluntary nervous system though they are not voluntary.

- (i) They operate against harmful stimuli which are generally external.
- (ii) They are connected with emergency i.e, response to stimuli.
- (iii) Some reflexes involve the brain, rather than the spinal cord.
- (iv) Reflex action is generally controlled by spinal cord.

**11.** Compare and contrast nervous and hormonal mechanism for control and coordination in animals.

**Ans.** In human beings, the nervous system controls the various functions by small units called neurons. Neurons receive the information through sensory nerves and transfer them through motor nerves. Whereas, hormones coordinate the activities and growth of the body. Important functions like sugar level metabolism, growth and development etc. are controlled by hormones secreted by endocrine glands. Hence, in human beings, hormones show long lasting responses. The action of hormones is highly specific.

**12.** What is the difference between the manner in which movement takes place in a sensitive plant and movement in our legs?

**Ans. Movement in a sensitive plant**

- (i) It occurs in response to an external stimulus like touch and shock.
- (ii) Plant cells change shape by changing the amount of water.
- (iii) No nerves are involved.
- (iv) There is no specialized tissue in plants for conduction of information.
- (v) Plant cells do not have specialized proteins.

**Movement in our legs**

- (i) It occurs in response to our requirements and is a voluntary action.
- (ii) Movement in our legs is voluntary action which is controlled by cerebellum part of hind brain.
- (iii) Nerves carry the message for movement of legs.
- (iv) There is specialized nervous tissue in animals for conduction of information and muscle cells to help in movement.
- (v) Animal cells have specialized protein which help muscles to contract or relax.

## Our Environment

**1.** Which of the following groups contain only biodegradable items?

- (a) Grass, flowers and leather
- (b) Grass, wood and plastic
- (c) Fruit-peels, cake and lime juice (a), (c) and (d).
- (d) Cake, wood and grass

**Ans.** (a), (c) and (d).

**2.** Which of the following constitute a food-chain?

- (a) Grass, wheat and mango
- (b) Grass, goat and human,
- (c) Goat, cow and elephant
- (d) Grass, fish and goat,

**Ans.** (b) Grass, goat and human

**3.** Which of the following are environment friendly practices?

- (a) Carrying cloth-bags to put purchases in while shopping
- (b) Switching off unnecessary lights and fans
- (c) Walking to school instead of getting your mother to drop you on her scooter
- (d) All of the above

**Ans.** (d) All of the above

**4.** What will happen if we kill all the organisms in one trophic level?

**Ans.** If all the organisms in one trophic level are killed then all the organisms of next trophic level which are dependent on these are killed. Next trophic levels will not get food to eat and the entire food chain gets disturbed. At the same time the organisms at the lower trophic level will reproduce and the population will increase in abundance thereby disturbing the ecosystem.

**5.** Will the impact of removing all the organisms in a trophic level be different for different trophic levels? Can the organisms of any trophic level be removed without causing any damage to the ecosystem?

**Ans.** The impact of removing all the organisms in a trophic level will be same. If the organisms of any trophic level be removed it will certainly damage the ecosystem.

For example,

Grass → Grass hopper Frog → Snake → Peacock

In this if all grasshoppers are killed/removed frogs will starve and grass will reproduce in abundance.

If snakes are removed then the number of frogs will increase which will disturb the entire ecosystem.

**6.** What is biological magnification? Will the levels of this magnification be different at different levels of the ecosystem?

**Ans.** The pesticides and chemicals are absorbed by plants from the soil and enter the food chain. Being non-biodegradable they accumulate progressively at each trophic level. As humans occupy the top level of any food chain, the maximum concentration of chemicals is found in our bodies. This is called biological magnification.

The level of magnification will be different at different trophic levels, the maximum concentrations will be at the highest trophic level and the chemical will be less at lower trophic levels.

**7.** What are the problems caused by the non-biodegradable waste that we generate?

**Ans.** (i) As the non-biodegradable waste cannot be broken down into simpler forms hence they keep on accumulating in nature causing pollution.

(ii) They cause diseases.

(iii) It also causes biological magnification.

**8.** If all the waste we generate is bio-degradable, will this have no impact on the environment?

**Ans.** If all the waste we generate is bio-degradable and is managed in such a way that it is allowed to decompose then it will have no impact on the environment.

**9.** Why is damage to the ozone layer a cause for concern? What steps are being taken to limit this damage?

**Ans.** Ozone layer in the stratosphere is very helpful in shielding harmful UV rays. In absence of ozone layer heavy damage to organisms may occur. It may cause diseases like skin cancer, cataract, reduced crop production etc.

The damage is limited by UNEP (United Nations Environment Programme), it has forged an agreement to freeze CFC production in 1986.

CFC— Chlorofluorocarbons used as refrigerants and in fire extinguishers

## Life Processes

**Q1.** The kidneys in human beings are a part of the system for

(a) nutrition.

(b) respiration.

(c) excretion.

(d) transportation.

**Ans.** (c) excretion.

**Q2.** The xylem in plants are responsible for

(a) transport of water.

(b) transport of food.

(c) transport of amino acids.

(d) transport of oxygen.

**Ans.** (a) transport of water.

**Q3.** The autotrophic mode of nutrition requires

(a) carbon dioxide and water.

(b) chlorophyll.

(c) sunlight.

(d) all of the above.

**Ans.** (d) All of the above.

**Q4.** The breakdown of pyruvate to give carbon dioxide, water and energy takes place in

(a) cytoplasm.

(b) chloroplast. (c) mitochondria.

(d) nucleus.

**Ans.** (c) mitochondria.

**Q5.** How are fats digested in our bodies? Where does this process take place?

**Ans.** Fats are digested in the small intestine. The secretion of liver, called bile, breaks down the large globules of fat into smaller globules. This is called emulsification of fats. The bile also makes the medium alkaline so that the pancreatic enzyme containing lipase further digests fats to form fatty acids. The alkaline medium is required for pancreatic enzyme to act on lipase.

**Q6.** What is the role of saliva in the digestion of food?

**Ans.** Saliva contains enzymes, salivary amylase and is released in our mouth. It breaks down starch into sugar (complex carbohydrates into simpler ones).

**Q7.** What are the necessary conditions for autotrophic nutrition and what are its byproducts?

**Ans.** For autotrophic nutrition to take place the conditions necessary are light, carbon dioxide and water should reach a cell which contains chlorophyll in it. Water first splits to release oxygen and hydrogen. This process is photolysis of water. Hydrogen then combines with carbon dioxide to form glucose.

The byproduct of the autotrophic nutrition is oxygen which is released through stomata.

**Q8.** What are the differences between aerobic and anaerobic respiration? Name some organisms that use the anaerobic mode of respiration.

**Ans.**

#### **Aerobic respiration**

1. Takes place in presence of oxygen.
2. Its end products are carbon dioxide and water.
3. More energy is released.
4. It takes place in cytoplasm and mitochondria.
5. Complete oxidation of glucose takes place.

#### **Anaerobic respiration**

- Takes place in absence of oxygen.
- Its end products are ethanol and carbon dioxide.
- Less energy is released.
- It takes place only in the cytoplasm.
- Incomplete oxidation of glucose takes place.

Some organisms that use the anaerobic mode of respiration are—yeast and bacteria.

**Q9.** How are the alveoli designed to maximise the exchange of gases?

**Ans.** The alveoli are present at the terminal of bronchioles. They are balloon shaped structures which increases the surface area for the exchange of gases and are richly supplied with blood vessels to take the oxygen to different cells.

**Q10.** What would be the consequences of a deficiency of haemoglobin in our bodies?

**Ans.** Haemoglobin is a red pigment present in our blood which carries oxygen to all the parts of the body.

If there is deficiency of haemoglobin then amount of oxygen reaching our body cells will decrease.

Which may lead to release of less energy in our body, leading to a disease called anaemia.

Breathlessness, tiredness and weakness are the symptoms of anaemia.

**Q11.** Describe double circulation in human beings. Why is it necessary?

**Ans.** The heart of human beings consist of two sides right and left.

The right side of the heart receives de-oxygenated blood from the cells and tissues and sends it further for purification to lungs.

The left side of the heart receives oxygenated blood from lungs which is pumped further and sent to all the parts of the body through blood vessels. This is called double circulation. The energy demand of human beings is too large and hence it is necessary for the separation of oxygenated and deoxygenated blood to meet this energy demand.

**Q12.** What are the differences between the transport of materials in xylem and phloem?

**Ans.**

#### **Transport in Xylem**

1. Water and mineral salts are transported.
2. The transport is generally passive.

#### **Transport In Phloem**

- Food in aqueous form is translocated.
- The transport is active.



3. Vessels and tracheids are dead cells.

Sieve tubes and companion cells are living cells.

**Q13.** Compare the functioning of alveoli in the lungs and nephrons in the kidneys with respect to their structure and functioning.

**Ans.**

**Alveoli**

1. It is the structural and functional unit of lungs.
2. It is thin walled, has a large surface area and is richly supplied with blood vessels.
3. It removes carbon dioxide from the blood.

**Nephron**

- It is the structural and functional unit of kidneys.
- It is thin walled, has a large surface area and is richly supplied with blood vessels.
- It removes nitrogenous wastes from the blood.