10th Class Biology Notes Punjab Board (PCTB) Full Book Notes

Complete chapter-wise study notes with original practice questions for Class 10 Biology, Punjab Curriculum and Textbook Board (PCTB), for all Punjab Boards of Intermediate and Secondary Education.

About these notes

These notes follow the chapters of the PCTB Biology book for Class 10, based on the Revised National Curriculum of Pakistan 2023. The ten chapters covered, in order, are:

1. Human Digestive System
2. Human Respiratory System
3. Human Blood Circulatory System
4. Human Urinary System
5. Coordination
6. Reproduction
7. Inheritance
8. Biotechnology
9. Diseases and Immunity
10. Evolution

About the paper (third-party reproduced, not officially confirmed): The Class 10 Biology theory paper is reported as 60 marks in total — 12 MCQs (1 mark each), short questions worth 30 marks (three sections, attempt any 5 of 8 in each), and long questions worth 18 marks (attempt any 2 of 3, each 9 marks: part (a) 5 + part (b) 4). This pattern is reproduced from third-party pairing-scheme sources, not read off an official PCTB, PECTAA or BISE document — confirm it from your board's current model paper. Practical marks are reported differently (15 marks on several result sites; 30 marks in a BISE Gujranwala notification dated 20 July 2026 reproduced online) — confirm the practical total with your board too.

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11. MCQ Answer Key (all chapters)

How to Use These Notes

Read one chapter at a time. First read the study notes and learn the key definitions and key terms. Then close the notes and try the multiple-choice questions, short questions, and long questions for that chapter from memory. Check your MCQ answers against the answer key at the end of the book. For short and long questions, write full answers in your own words in a notebook, then compare them with the notes.

Revise regularly: read the key definitions of each chapter again after a few days, and attempt the questions a second time before your tests and examinations.

> **A note on accuracy:** Where a figure or value has not been verified from an official source, it has been left out of these notes rather than guessed. For the official paper pattern, always consult the current model paper of your Punjab board.

CHAPTER 1

Human Digestive System

Digestion is the breakdown of large, insoluble food molecules into small, soluble molecules that the body can absorb and use. The human digestive system is a long tube, the alimentary canal, with associated glands. Food passes through the mouth, oesophagus, stomach, small intestine and large intestine in order.

The Mouth and Oesophagus

In the mouth, food is chewed by the teeth and mixed with saliva. An adult has 32 permanent teeth: incisors for cutting, canines for tearing, and premolars and molars for grinding. Saliva contains salivary amylase, which begins starch digestion. The tongue rolls food into a bolus, which is swallowed. The bolus travels down the oesophagus by peristalsis — rhythmic waves of muscle contraction that push food towards the stomach.

The Stomach

The stomach is a muscular, bag-like organ. Its wall produces gastric juice, which contains hydrochloric acid and the enzyme pepsin. The acid kills germs in food and provides the acidic medium pepsin needs; pepsin begins the digestion of proteins into peptides. The stomach churns food into chyme, which passes little by little into the small intestine.

The Small Intestine and Associated Glands

Most digestion and absorption take place in the small intestine. The liver makes bile, stored in the gall bladder; bile emulsifies fats, breaking large fat drops into tiny droplets so enzymes can act on them. The pancreas produces pancreatic juice containing amylase, lipase and trypsin, which digest starch, fats and proteins. Intestinal juice completes digestion. The inner wall of the ileum has millions of finger-like villi, which greatly increase the surface area for absorption of digested food into the blood.

The Large Intestine

In the large intestine, water and mineral salts are absorbed. The remaining waste, faeces, is stored in the rectum and removed through the anus — this is egestion.

> **Remember:** Starch digestion begins in the mouth, protein digestion in the stomach, and fat digestion in the small intestine. Absorption takes place mainly in the ileum through the villi.

Common Disorders

- **Constipation:** infrequent, hard stools, often from a low-fibre diet.
- **Diarrhoea:** frequent watery stools, often from infection; it can cause dehydration.
- **Peptic ulcer:** a sore in the stomach or duodenum lining, linked with excess acid.
- **Jaundice:** yellowing of skin and eyes when the liver is diseased.

CHAPTER 1 — PRACTICE QUESTIONS

Human Digestive System

Multiple Choice Questions

Choose the correct answer. The answer key is given at the end of the book.

1. The enzyme in saliva that begins starch digestion is
(A) Pepsin (B) Salivary amylase (C) Lipase (D) Trypsin

2. Food is pushed down the oesophagus by
(A) Diffusion (B) Osmosis (C) Peristalsis (D) Filtration

3. Hydrochloric acid in the stomach
(A) Digests fats (B) Kills germs and activates pepsin (C) Absorbs food (D) Produces bile

4. Pepsin digests
(A) Starch (B) Fats (C) Proteins (D) Vitamins

5. Bile is produced by the
(A) Pancreas (B) Gall bladder (C) Liver (D) Stomach

6. The main site of absorption of digested food is the
(A) Stomach (B) Duodenum (C) Ileum (D) Colon

7. Villi are found in the
(A) Stomach (B) Small intestine (C) Large intestine (D) Oesophagus

8. The semi-liquid food leaving the stomach is called
(A) Bolus (B) Chyme (C) Faeces (D) Bile

9. Pancreatic lipase digests
(A) Starch (B) Proteins (C) Fats (D) Cellulose

10. Water is mainly absorbed in the
(A) Mouth (B) Stomach (C) Small intestine (D) Large intestine

CHAPTER 1 — PRACTICE QUESTIONS

Human Digestive System

Short Questions

Q1. Define digestion.

Answer: Digestion is the breakdown of large, insoluble food molecules into small, soluble molecules that can be absorbed into the blood and used by the body.

Q2. What is peristalsis?

Answer: Peristalsis is the rhythmic wave of contraction and relaxation of the muscles of the alimentary canal that pushes food along the gut.

Q3. Why is hydrochloric acid present in gastric juice?

Answer: It kills germs in food and provides the acidic medium in which the enzyme pepsin works best.

Q4. What is the function of villi?

Answer: Villi are finger-like projections in the ileum that increase the surface area for absorption of digested food into the blood.

Q5. Name two disorders of the digestive system and one cause of each.

Answer: Constipation, often caused by a low-fibre diet; diarrhoea, often caused by infection from contaminated food or water.

Long Questions

Q1. Describe the process of digestion in the small intestine, including the roles of the liver and pancreas.

Answer outline: Food enters the duodenum as chyme; bile from the liver emulsifies fats; pancreatic juice provides amylase, lipase and trypsin; intestinal juice completes digestion to glucose, amino acids, fatty acids and glycerol; these are absorbed through the villi of the ileum into the blood and lymph.

Q2. Describe the structure and functions of the stomach in digestion.

Answer outline: The stomach is a muscular bag; its glands secrete gastric juice containing hydrochloric acid and pepsin; acid kills germs and activates pepsin; pepsin digests proteins to peptides; churning mixes food into chyme, which is released slowly into the small intestine.

CHAPTER 2

Human Respiratory System

Respiration is the process by which living things take in oxygen and release carbon dioxide, and by which food is broken down in cells to release energy. In humans, gaseous exchange takes place in the lungs. The air passage consists of the nose, pharynx, larynx, trachea, bronchi, bronchioles and alveoli.

The Air Passage and the Lungs

Air enters through the nose, where it is warmed, moistened and filtered by hairs and mucus. It passes through the trachea, which is kept open by rings of cartilage, and divides into two bronchi, one to each lung. Inside the lungs the bronchi divide into smaller bronchioles ending in tiny air sacs called alveoli. The alveoli are surrounded by a dense network of blood capillaries, and their walls are only one cell thick, so gases diffuse easily across them.

Breathing and Gaseous Exchange

Breathing in (inspiration) happens when the diaphragm contracts and flattens and the rib muscles raise the ribs; the chest volume increases, air pressure inside falls, and air rushes in. Breathing out (expiration) happens when the diaphragm relaxes and the ribs fall, pushing air out. In the alveoli, oxygen diffuses from the air into the blood and carbon dioxide diffuses from the blood into the air to be breathed out. Oxygen is carried to the tissues by haemoglobin in red blood cells, and carbon dioxide is carried back, mainly dissolved in the plasma.

Cellular Respiration

In the cells, glucose is broken down using oxygen to release energy, carbon dioxide and water. This energy is used for all life activities. When oxygen is scarce, for example during very hard exercise, anaerobic respiration can occur in muscle cells, producing lactic acid and less energy.

> **Remember:** Breathing is the physical movement of air in and out of the lungs; gaseous exchange is the diffusion of oxygen and carbon dioxide across the alveolar walls; cellular respiration is the release of energy from glucose inside cells.

Respiratory Disorders

- **Asthma:** narrowed airways causing wheezing and difficulty breathing.
- **Bronchitis:** inflamed bronchi causing a persistent cough with mucus.
- **Pneumonia:** lung infection in which alveoli fill with fluid.
- **Tuberculosis:** a bacterial lung infection spread through the air by coughing.
- **Smoking:** damages airways and alveoli and greatly increases the risk of lung cancer.

CHAPTER 2 — PRACTICE QUESTIONS

Human Respiratory System

Multiple Choice Questions

Choose the correct answer. The answer key is given at the end of the book.

1. Gaseous exchange in humans takes place in the
(A) Bronchi (B) Alveoli (C) Trachea (D) Larynx

2. The trachea is kept open by
(A) Muscle (B) Bone (C) Rings of cartilage (D) Blood vessels

3. During inspiration the diaphragm
(A) Relaxes and rises (B) Contracts and flattens (C) Stops moving (D) Pushes the ribs down

4. Oxygen is carried in the blood mainly by
(A) Plasma (B) Platelets (C) Haemoglobin in red blood cells (D) White blood cells

5. The alveoli are surrounded by
(A) Lymph vessels (B) Nerves (C) Blood capillaries (D) Fat cells

6. In cellular respiration, glucose is broken down to release
(A) Oxygen (B) Energy, carbon dioxide and water (C) Nitrogen (D) Starch

7. Anaerobic respiration in muscle cells produces
(A) Ethanol (B) Lactic acid (C) Acetic acid (D) Oxygen

8. Pneumonia is an infection of the
(A) Bronchi only (B) Alveoli of the lungs (C) Trachea (D) Nose

9. Tuberculosis is caused by
(A) A virus (B) A bacterium (C) A fungus (D) Smoking only

10. Smoking increases the risk of
(A) Diabetes (B) Lung cancer (C) Kidney stones (D) Anaemia

CHAPTER 2 — PRACTICE QUESTIONS

Human Respiratory System

Short Questions

Q1. What is respiration?

Answer: Respiration is the process by which food, mainly glucose, is broken down in cells to release energy, using oxygen and producing carbon dioxide and water.

Q2. How are the alveoli adapted for gaseous exchange?

Answer: They have very thin walls one cell thick, a large surface area, a rich blood supply, and a moist surface, so gases diffuse across them quickly.

Q3. Describe inspiration.

Answer: The diaphragm contracts and flattens and the ribs are raised, the chest volume increases, pressure inside the lungs falls, and air rushes in.

Q4. What is asthma?

Answer: Asthma is a disorder in which the airways narrow, causing difficulty in breathing, wheezing and coughing, often triggered by dust, pollen or cold air.

Q5. Why is smoking harmful to the lungs?

Answer: Tobacco smoke damages the airways and alveoli, causes bronchitis and emphysema, and greatly increases the risk of lung cancer.

Long Questions

Q1. Describe the structure of the human respiratory system and explain how gaseous exchange takes place in the alveoli.

Answer outline: Air passes through the nose, pharynx, larynx, trachea, bronchi and bronchioles to the alveoli; the alveoli have thin walls and a dense capillary network; oxygen diffuses into the blood and carbon dioxide diffuses out, driven by concentration differences; haemoglobin carries oxygen to the tissues.

Q2. Explain the mechanism of breathing and describe the effects of smoking on the respiratory system.

Answer outline: Inspiration: diaphragm flattens, ribs rise, chest volume increases, air enters. Expiration: diaphragm relaxes, ribs fall, air is pushed out. Smoking damages airways and alveoli, causes chronic bronchitis and emphysema, and increases the risk of lung cancer.

CHAPTER 3

Human Blood Circulatory System

The circulatory system transports materials around the body. It consists of the heart, the blood vessels and the blood. The heart pumps blood through two circuits: the pulmonary circuit to the lungs and the systemic circuit to the rest of the body. This is called double circulation.

Blood

Blood is made of plasma and blood cells. Plasma is the pale yellow liquid that carries dissolved food, hormones, waste and proteins. Red blood cells contain haemoglobin, which carries oxygen, and have no nucleus so they can carry more haemoglobin. White blood cells defend the body against disease. Platelets help the blood to clot at a wound.

The Heart

The heart is a muscular organ with four chambers: two atria above and two ventricles below. The right side pumps deoxygenated blood to the lungs; the left side pumps oxygenated blood to the body. Valves between the chambers prevent blood from flowing backwards. The heart beats about 72 times per minute at rest in an adult, and the heartbeat is controlled by a natural pacemaker in the right atrium.

Blood Vessels

Arteries carry blood away from the heart under high pressure and have thick, elastic walls. Veins carry blood towards the heart under lower pressure and have valves to prevent backflow. Capillaries are tiny, thin-walled vessels where exchange of materials between blood and tissues takes place. Blood pressure is the force of blood against the artery walls; it is measured as systolic pressure over diastolic pressure.

> **Remember:** In double circulation, blood passes through the heart twice in one complete circuit — once on its way to the lungs and once on its way to the body. This keeps oxygenated and deoxygenated blood separate.

Disorders of the Circulatory System

- **Hypertension:** persistently high blood pressure, straining the heart and kidneys.
- **Anaemia:** shortage of red blood cells or haemoglobin, often from lack of iron.
- **Leukaemia:** a cancer in which abnormal white blood cells are produced in large numbers.
- **Heart attack:** a blocked coronary artery starves part of the heart muscle of oxygen.
- **Thalassaemia:** an inherited disorder producing abnormal haemoglobin and severe anaemia.

CHAPTER 3 — PRACTICE QUESTIONS

Human Blood Circulatory System

Multiple Choice Questions

Choose the correct answer. The answer key is given at the end of the book.

1. The heart has how many chambers?
(A) Two (B) Three (C) Four (D) Five

2. Haemoglobin is found in
(A) White blood cells (B) Platelets (C) Plasma (D) Red blood cells

3. Double circulation means blood passes through the heart
(A) Once per circuit (B) Twice per circuit (C) Three times per circuit (D) Never

4. Arteries carry blood
(A) Towards the heart (B) Away from the heart (C) Only to the lungs (D) Only to the brain

5. Valves are present in
(A) Arteries (B) Capillaries (C) Veins (D) Alveoli

6. Exchange of materials between blood and tissues takes place in the
(A) Arteries (B) Veins (C) Capillaries (D) Heart

7. Blood clotting is helped by
(A) Red blood cells (B) White blood cells (C) Platelets (D) Plasma proteins only

8. The natural pacemaker of the heart is in the
(A) Left ventricle (B) Right atrium (C) Left atrium (D) Aorta

9. Anaemia is caused by a shortage of
(A) Platelets (B) Haemoglobin or red blood cells (C) White blood cells (D) Plasma

10. A heart attack is caused by blockage of a
(A) Pulmonary vein (B) Coronary artery (C) Carotid artery (D) Renal artery

CHAPTER 3 — PRACTICE QUESTIONS

Human Blood Circulatory System

Short Questions

Q1. What is double circulation?

Answer: Double circulation is the circulation in which blood passes through the heart twice in one complete circuit — once to the lungs and once to the body.

Q2. State the functions of red blood cells.

Answer: Red blood cells carry oxygen from the lungs to the tissues and carry some carbon dioxide back, using the pigment haemoglobin.

Q3. How do arteries differ from veins?

Answer: Arteries have thick elastic walls, carry blood away from the heart under high pressure and have no valves; veins have thinner walls, carry blood towards the heart under low pressure and have valves.

Q4. What is blood pressure?

Answer: Blood pressure is the force exerted by the blood on the walls of the arteries as the heart pumps; it is recorded as systolic over diastolic pressure.

Q5. What is hypertension?

Answer: Hypertension is persistently high blood pressure, which strains the heart and can damage the kidneys, eyes and brain.

Long Questions

Q1. Describe the structure of the human heart and explain how blood flows through it.

Answer outline: The heart has four chambers, two atria and two ventricles, separated by a septum, with valves preventing backflow; deoxygenated blood enters the right atrium, goes to the lungs, returns oxygenated to the left atrium, and is pumped by the left ventricle to the body.

Q2. Compare arteries, veins and capillaries, and explain the importance of double circulation.

Answer outline: Arteries: thick elastic walls, away from heart, high pressure. Veins: thin walls, towards heart, valves, low pressure. Capillaries: one cell thick, site of exchange. Double circulation keeps oxygenated and deoxygenated blood separate and maintains high pressure for efficient supply to the body.

CHAPTER 4

Human Urinary System

Excretion is the removal of metabolic waste products from the body. The main excretory organs in humans are the kidneys, which remove urea, excess water and salts from the blood and form urine. The urinary system consists of two kidneys, two ureters, the urinary bladder and the urethra.

Structure of the Kidney

Each kidney is a bean-shaped organ. Its outer part is the cortex and the inner part is the medulla. The functional unit of the kidney is the nephron. Each kidney contains about one million nephrons. A nephron consists of a cup-shaped Bowman's capsule surrounding a knot of capillaries called the glomerulus, and a long tubule divided into the proximal convoluted tubule, the loop of Henle and the distal convoluted tubule, which opens into a collecting duct.

Formation of Urine

Urine formation takes place in three steps. First, filtration: blood pressure forces water, salts, glucose, amino acids and urea out of the glomerulus into the Bowman's capsule, forming the filtrate; blood cells and large proteins stay in the blood. Second, selective reabsorption: as the filtrate flows along the tubule, useful substances — all the glucose, most of the water and salts — are reabsorbed into the blood. Third, secretion: extra waste substances and hydrogen ions are secreted from the blood into the tubule. The remaining liquid is urine, which collects in the bladder and is passed out through the urethra.

Osmoregulation

The kidneys also control the water and salt balance of the body, a process called osmoregulation. When the body has too little water, the kidneys produce a small volume of concentrated urine; when there is too much water, they produce a large volume of dilute urine. A hormone called ADH (antidiuretic hormone), released by the pituitary gland, controls how much water the kidneys reabsorb.

> **Remember:** Urea is formed in the liver from excess amino acids and is removed by the kidneys. Glucose is normally absent from urine because it is completely reabsorbed; its presence in urine is a sign of diabetes.

Disorders of the Urinary System

- **Kidney failure:** the kidneys cannot filter blood properly; treated by dialysis or transplant.
- **Kidney stones:** hard salt deposits that can block urine flow and cause severe pain.
- **Urinary tract infection:** infection of the bladder or urethra, causing pain.
- **Dialysis:** a machine filters the blood when the kidneys have failed.

CHAPTER 4 — PRACTICE QUESTIONS

Human Urinary System

Multiple Choice Questions

Choose the correct answer. The answer key is given at the end of the book.

1. The functional unit of the kidney is the
(A) Neuron (B) Nephron (C) Alveolus (D) Villus

2. Urine is formed in the
(A) Liver (B) Kidney (C) Bladder (D) Ureter

3. The glomerulus is a knot of
(A) Nerves (B) Muscle fibres (C) Blood capillaries (D) Lymph vessels

4. In the Bowman's capsule, the process that takes place is
(A) Reabsorption (B) Secretion (C) Filtration (D) Osmoregulation

5. All the glucose in the filtrate is
(A) Excreted in urine (B) Reabsorbed into the blood (C) Stored in the bladder (D) Converted to urea

6. Urea is formed in the
(A) Kidney (B) Liver (C) Pancreas (D) Spleen

7. ADH controls the reabsorption of
(A) Glucose (B) Salts (C) Water (D) Urea

8. Urine is stored in the
(A) Ureter (B) Urinary bladder (C) Urethra (D) Kidney

9. A patient with kidney failure may be treated by
(A) Dialysis (B) Vaccination (C) Blood transfusion (D) Antibiotics

10. Kidney stones are deposits of
(A) Glucose (B) Salts (C) Proteins (D) Fats

CHAPTER 4 — PRACTICE QUESTIONS

Human Urinary System

Short Questions

Q1. Define excretion.

Answer: Excretion is the removal of metabolic waste products, such as urea, excess water and salts, from the body.

Q2. Name the parts of the human urinary system.

Answer: Two kidneys, two ureters, the urinary bladder and the urethra.

Q3. What is a nephron?

Answer: A nephron is the functional unit of the kidney; it consists of a Bowman's capsule with a glomerulus and a long tubule that filters blood and forms urine.

Q4. What is osmoregulation?

Answer: Osmoregulation is the control of the water and salt balance of the body, mainly by the kidneys.

Q5. What is dialysis?

Answer: Dialysis is the artificial filtering of the blood by a machine when the kidneys have failed.

Long Questions

Q1. Describe the structure of a nephron and explain how urine is formed.

Answer outline: A nephron has a Bowman's capsule around a glomerulus, a proximal tubule, loop of Henle, distal tubule and collecting duct. Urine forms by filtration in the capsule, selective reabsorption of glucose, water and salts along the tubule, and secretion of extra wastes; the remaining liquid is urine.

Q2. Explain how the kidneys control the water balance of the body and describe kidney failure and its treatment.

Answer outline: The kidneys adjust urine volume and concentration; ADH increases water reabsorption when the body is short of water. In kidney failure the kidneys cannot filter blood, waste builds up, and the patient is treated by dialysis or kidney transplant.

CHAPTER 5

Coordination

Coordination is the process by which the body detects changes in its surroundings and responds in an organised way. In humans it is carried out by the nervous system, which sends rapid electrical messages, and the endocrine system, which sends slower chemical messages called hormones.

The Nervous System

The nervous system is divided into the central nervous system (CNS), made of the brain and spinal cord, and the peripheral nervous system (PNS), made of the nerves that connect the CNS to the rest of the body. The basic unit is the neuron. A neuron has a cell body, dendrites that receive messages, and a long axon that carries messages away. Messages travel as electrical impulses, and pass from one neuron to the next across a small gap called a synapse by means of chemicals.

The Brain and Spinal Cord

The brain has three main parts. The cerebrum, the largest part, controls thought, memory, learning and voluntary movement. The cerebellum coordinates balance and movement. The medulla controls involuntary actions such as heartbeat and breathing.

Reflex Action

A reflex action is a fast, automatic response to a stimulus, such as pulling the hand away from a hot object. The impulse travels from receptor to sensory neuron, relay neuron in the spinal cord, motor neuron, and effector muscle — without waiting for the brain. This pathway is called a reflex arc.

Receptors: The Eye and the Ear

Receptors detect stimuli. In the eye, light enters through the cornea and pupil, is focused by the lens onto the retina, and the retina sends impulses to the brain through the optic nerve. In the ear, sound vibrations move the eardrum and the small bones of the middle ear, and the cochlea converts them into nerve impulses.

The Endocrine System

Endocrine glands release hormones directly into the blood. Important glands are the pituitary, thyroid, pancreas, adrenal glands and gonads. Insulin from the pancreas lowers blood glucose; a lack of insulin causes diabetes. Thyroxine from the thyroid controls metabolic rate. Adrenaline from the adrenal glands prepares the body for emergency, raising the heartbeat and blood glucose.

> **Remember:** Nervous coordination is fast, brief and precise; hormonal coordination is slower, longer-lasting and more general.

Disorders: diabetes (too little insulin, so blood glucose stays high) and goitre (swelling of the thyroid gland, often from lack of iodine).

CHAPTER 5 — PRACTICE QUESTIONS

Coordination

Multiple Choice Questions

Choose the correct answer. The answer key is given at the end of the book.

1. The basic unit of the nervous system is the
(A) Nephron (B) Neuron (C) Alveolus (D) Villus

2. The central nervous system consists of the
(A) Brain and nerves (B) Brain and spinal cord (C) Spinal cord and nerves (D) Nerves only

3. The gap between two neurons is called a
(A) Node (B) Synapse (C) Axon (D) Dendrite

4. The cerebrum controls
(A) Heartbeat (B) Breathing (C) Thought, memory and voluntary movement (D) Balance

5. A reflex action is controlled by the
(A) Brain only (B) Spinal cord (C) Cerebellum (D) Medulla only

6. Light is focused onto the retina by the
(A) Cornea (B) Iris (C) Lens (D) Pupil

7. Sound is converted into nerve impulses in the
(A) Eardrum (B) Cochlea (C) Ossicles (D) Pinna

8. Insulin is produced by the
(A) Thyroid (B) Adrenal gland (C) Pancreas (D) Pituitary

9. Adrenaline prepares the body for
(A) Sleep (B) Emergency (C) Digestion (D) Growth

10. Goitre is caused by lack of
(A) Iron (B) Iodine (C) Calcium (D) Vitamin C

CHAPTER 5 — PRACTICE QUESTIONS

Coordination

Short Questions

Q1. What is coordination?

Answer: Coordination is the process by which the body detects changes in the environment and responds to them in an organised way, using the nervous and endocrine systems.

Q2. What is a reflex action?

Answer: A reflex action is a fast, automatic response to a stimulus, such as pulling the hand away from a hot object, controlled by the spinal cord.

Q3. Name the three main parts of the brain and one function of each.

Answer: Cerebrum: thought, memory and voluntary movement. Cerebellum: balance and coordination of movement. Medulla: involuntary actions such as heartbeat and breathing.

Q4. What is a hormone?

Answer: A hormone is a chemical messenger released by an endocrine gland into the blood, which controls a target organ or process.

Q5. What is diabetes?

Answer: Diabetes is a disorder in which the pancreas produces too little insulin, so blood glucose remains high.

Long Questions

Q1. Describe the structure of a neuron and explain how a nerve impulse travels and how a reflex arc works.

Answer outline: A neuron has a cell body, dendrites and an axon; impulses travel electrically along the neuron and chemically across synapses. In a reflex arc the impulse goes from receptor to sensory neuron, relay neuron in the spinal cord, motor neuron, and effector muscle, producing a fast automatic response.

Q2. Compare nervous and hormonal coordination, and describe the roles of insulin, thyroxine and adrenaline.

Answer outline: Nervous coordination is fast, brief and precise; hormonal coordination is slower, longer-lasting and general. Insulin lowers blood glucose; thyroxine controls metabolic rate; adrenaline prepares the body for emergency by raising heartbeat and blood glucose.

CHAPTER 6

Reproduction

Reproduction is the process by which living things produce new individuals of their own kind. It is essential for the continuation of a species. There are two main types: asexual reproduction, in which a single parent produces offspring identical to itself, and sexual reproduction, in which two parents produce offspring that show variation.

Asexual Reproduction

In asexual reproduction there is no fusion of gametes. Common methods are binary fission in bacteria and Amoeba, budding in Hydra and yeast, spore formation in fungi, and vegetative propagation in plants, for example by runners, bulbs and stem cuttings. Offspring produced this way are clones of the parent.

Sexual Reproduction in Humans

In humans, sexual reproduction involves male and female gametes. The male reproductive system produces sperms in the testes; the sperms are carried through the sperm duct and released through the penis. The female reproductive system produces eggs in the ovaries; each month an egg is released into the oviduct. Fertilisation takes place in the oviduct when a sperm fuses with an egg to form a zygote. The zygote develops into an embryo, which implants in the wall of the uterus and grows into a foetus, nourished through the placenta and umbilical cord. After about nine months the baby is born.

Sexual Reproduction in Flowering Plants

A flower is the reproductive part of a plant. The male parts are the stamens, which produce pollen in the anthers; the female part is the carpel, which contains the ovary with ovules. Pollination is the transfer of pollen from an anther to a stigma, by wind, insects or other agents. After pollination, a pollen tube grows to the ovule and fertilisation takes place. The ovule becomes a seed and the ovary becomes a fruit. The seed germinates when conditions are suitable, and a new plant grows.

> **Remember:** In sexual reproduction the offspring receive half their chromosomes from each parent, so they show variation; in asexual reproduction the offspring are genetically identical to the single parent.

Methods of Reproduction in Plants

- **Vegetative propagation:** new plants grow from stems, roots or leaves, for example runners in strawberry and bulbs in onion.
- **Artificial propagation:** farmers use cutting, grafting and layering to grow new plants with desired characters.
- **Seed formation:** the result of sexual reproduction in flowering plants; seeds can survive unfavourable conditions and spread to new places.

CHAPTER 6 — PRACTICE QUESTIONS

Reproduction

Multiple Choice Questions

Choose the correct answer. The answer key is given at the end of the book.

1. Offspring produced by asexual reproduction are
(A) Different from the parent (B) Identical to the parent (C) Always male (D) Always female

2. Budding occurs in
(A) Amoeba (B) Hydra (C) Paramecium (D) Mushroom

3. In humans, sperms are produced in the
(A) Ovary (B) Testis (C) Uterus (D) Prostate gland

4. Fertilisation in humans takes place in the
(A) Uterus (B) Ovary (C) Oviduct (D) Vagina

5. The zygote is formed by the fusion of
(A) Two eggs (B) Sperm and egg (C) Two sperms (D) Embryo and ovum

6. The male part of a flower is the
(A) Carpel (B) Stamen (C) Sepal (D) Petal

7. Pollination is the transfer of pollen to the
(A) Ovary (B) Anther (C) Stigma (D) Ovule

8. After fertilisation, the ovule becomes a
(A) Fruit (B) Flower (C) Seed (D) Leaf

9. The foetus is nourished through the
(A) Umbilical cord and placenta (B) Oviduct (C) Ovary (D) Amniotic sac only

10. Vegetative propagation in strawberry takes place by
(A) Bulbs (B) Runners (C) Seeds (D) Cutting

CHAPTER 6 — PRACTICE QUESTIONS

Reproduction

Short Questions

Q1. Define reproduction.

Answer: Reproduction is the process by which living things produce new individuals of their own kind, ensuring the continuation of the species.

Q2. What is the difference between asexual and sexual reproduction?

Answer: Asexual reproduction involves one parent and produces identical offspring without gametes; sexual reproduction involves two parents and gametes, and produces offspring that show variation.

Q3. What is pollination?

Answer: Pollination is the transfer of pollen grains from the anther of a flower to the stigma of the same or another flower.

Q4. Where does fertilisation occur in humans?

Answer: Fertilisation occurs in the oviduct, when a sperm fuses with an egg to form a zygote.

Q5. Give two examples of vegetative propagation.

Answer: Runners in strawberry plants and bulbs in onion are examples of vegetative propagation.

Long Questions

Q1. Describe sexual reproduction in humans, from gamete production to birth.

Answer outline: Sperms are produced in the testes and eggs in the ovaries; fertilisation occurs in the oviduct forming a zygote; the zygote becomes an embryo that implants in the uterus; the foetus is nourished through the placenta and umbilical cord; after about nine months the baby is born.

Q2. Describe sexual reproduction in a flowering plant, including pollination, fertilisation and seed formation.

Answer outline: Pollen is produced in the anthers and transferred to the stigma by pollination; a pollen tube carries the male gamete to the ovule where fertilisation occurs; the ovule becomes a seed and the ovary becomes a fruit; the seed germinates into a new plant under suitable conditions.

CHAPTER 7

Inheritance

Inheritance is the passing of characters from parents to offspring. The study of inheritance is called genetics. The work of Gregor Mendel, who studied pea plants in the 19th century, laid the foundation of genetics.

Genes, Chromosomes and Alleles

Characters are controlled by genes, which are sections of DNA on chromosomes. Humans have 46 chromosomes in each body cell, arranged in 23 pairs. Each gene can exist in different forms called alleles. An allele that shows its effect even when only one copy is present is dominant; an allele that shows its effect only when two copies are present is recessive. An organism with two identical alleles is homozygous; with two different alleles it is heterozygous. The genetic make-up of an organism is its genotype; the observable characters are its phenotype.

Mendel's Laws

Mendel crossed pea plants differing in one character, such as tall and dwarf height. In the first generation all the plants were tall, showing that tallness is dominant. When these were crossed, the second generation showed tall and dwarf plants in a ratio of about 3:1. Mendel's law of segregation states that the two alleles of a gene separate during gamete formation, so each gamete carries only one allele. His law of independent assortment states that alleles of different genes are inherited independently of each other.

Co-dominance and Incomplete Dominance

Sometimes neither allele is fully dominant. In incomplete dominance, the heterozygote shows an intermediate character — for example, crossing red and white flowers of snapdragon gives pink flowers. In co-dominance, both alleles show their effect in the heterozygote — for example, in human blood groups, the alleles for A and B are co-dominant, so a person with both alleles has blood group AB.

Sex Determination and Variations

In humans, sex is determined by the sex chromosomes: females have two X chromosomes (XX) and males have one X and one Y (XY). A child receives an X chromosome from the mother and either an X or a Y from the father, so the father determines the sex of the child. Variations are the differences between individuals of the same species. They arise from the shuffling of genes during sexual reproduction and from mutations — sudden changes in genes or chromosomes, which can be caused by radiation or certain chemicals.

> **Remember:** In a monohybrid cross of two heterozygotes, the phenotypic ratio in the offspring is 3:1 and the genotypic ratio is 1:2:1. Blood group O is recessive to both A and B.

CHAPTER 7 — PRACTICE QUESTIONS

Inheritance

Multiple Choice Questions

Choose the correct answer. The answer key is given at the end of the book.

1. The study of inheritance is called
(A) Ecology (B) Genetics (C) Evolution (D) Cytology

2. Genes are sections of
(A) Protein (B) DNA on chromosomes (C) Lipid (D) Carbohydrate

3. Humans have how many chromosomes in a body cell?
(A) 23 (B) 44 (C) 46 (D) 48

4. An allele that shows its effect only with two copies is
(A) Dominant (B) Recessive (C) Co-dominant (D) Mutant

5. The observable characters of an organism are its
(A) Genotype (B) Phenotype (C) Karyotype (D) Allele

6. In a monohybrid cross of two heterozygotes, the phenotypic ratio is
(A) 1:1 (B) 1:2:1 (C) 3:1 (D) 2:1

7. Mendel's law of segregation states that alleles
(A) Stay together (B) Separate during gamete formation (C) Are always dominant (D) Never change

8. Pink flowers from red and white snapdragons show
(A) Complete dominance (B) Incomplete dominance (C) Co-dominance (D) Mutation

9. Blood group AB is an example of
(A) Incomplete dominance (B) Co-dominance (C) Recessive inheritance (D) Sex linkage

10. In humans, the sex of the child is determined by the
(A) Mother (B) Father (C) Environment (D) Placenta

CHAPTER 7 — PRACTICE QUESTIONS

Inheritance

Short Questions

Q1. Define genetics.

Answer: Genetics is the study of inheritance — how characters are passed from parents to offspring through genes.

Q2. What is the difference between genotype and phenotype?

Answer: Genotype is the genetic make-up of an organism; phenotype is the observable characters that result from the genotype and the environment.

Q3. State Mendel's law of segregation.

Answer: The two alleles of a gene separate during gamete formation, so each gamete carries only one allele for each character.

Q4. What is a mutation?

Answer: A mutation is a sudden change in a gene or chromosome, which can be caused by radiation or certain chemicals and can produce new variations.

Q5. How is sex determined in humans?

Answer: Females have XX sex chromosomes and males have XY; a child receives an X from the mother and either an X or a Y from the father, so the father determines the sex.

Long Questions

Q1. Explain Mendel's monohybrid cross between tall and dwarf pea plants, giving the ratios in the first and second generations.

Answer outline: Tall is dominant over dwarf. Crossing pure tall with pure dwarf gives all tall offspring in the first generation. Crossing these heterozygotes gives tall and dwarf in a 3:1 phenotypic ratio and a 1:2:1 genotypic ratio in the second generation, because the alleles separate during gamete formation.

Q2. Explain incomplete dominance and co-dominance with examples, and describe how sex is determined in humans.

Answer outline: In incomplete dominance the heterozygote is intermediate, e.g. pink snapdragon flowers from red and white parents. In co-dominance both alleles show, e.g. blood group AB. Sex is determined by X and Y chromosomes: XX is female and XY is male, and the father's sperm decides the sex of the child.

CHAPTER 8

Biotechnology

Biotechnology is the use of living organisms, cells or biological processes to make useful products. It is one of the oldest and also one of the newest branches of biology: people have used microbes to make bread, yoghurt and cheese for centuries, while modern biotechnology uses genetic engineering to change the DNA of organisms.

Fermentation

Fermentation is the breakdown of sugars by microbes in the absence of oxygen. Yeast ferments glucose to produce ethanol and carbon dioxide; the carbon dioxide makes bread rise, and the ethanol is used to make alcoholic drinks. Bacteria ferment milk sugar to lactic acid to make yoghurt and cheese. Fermentation is also used to make vinegar and to produce biogas from animal waste.

Genetic Engineering

Genetic engineering is the deliberate changing of the DNA of an organism. A useful gene is cut from one organism using enzymes and inserted into another organism, often a bacterium, using a vector such as a plasmid. The bacterium then multiplies and produces the product of the gene. A famous example is human insulin: the human insulin gene is inserted into bacteria, which then produce insulin used to treat diabetes. Other examples are growth hormone and vaccines produced by genetically modified microbes.

Genetic Engineering in Plants and Animals

Plants can be genetically modified to resist pests, tolerate drought or produce more food — such plants are called genetically modified (GM) crops. Animals can be modified to produce useful proteins in their milk or to grow faster. In medicine, gene therapy aims to treat inherited diseases by inserting a normal gene into a patient's cells.

Single-Cell Protein

Single-cell protein is protein-rich food produced from single-celled organisms such as yeast, algae or bacteria grown on cheap materials. It can be used as animal feed and, after processing, as human food. It is a possible answer to food shortage because microbes grow very fast and need little land.

> **Remember:** Biotechnology has great benefits — better medicines, more food and new vaccines — but it also raises ethical questions, such as the safety of GM foods and the ownership of living things, which societies must decide carefully.

CHAPTER 8 — PRACTICE QUESTIONS

Biotechnology

Multiple Choice Questions

Choose the correct answer. The answer key is given at the end of the book.

1. Biotechnology is the use of
(A) Chemicals only (B) Living organisms to make useful products (C) Machines in farming (D) Fossil fuels

2. Yeast fermentation of glucose produces
(A) Lactic acid and oxygen (B) Ethanol and carbon dioxide (C) Acetic acid and water (D) Methane and hydrogen

3. Yoghurt is made by bacteria fermenting milk sugar to
(A) Ethanol (B) Acetic acid (C) Lactic acid (D) Citric acid

4. In genetic engineering, a useful gene is often carried into a bacterium by a
(A) Chromosome (B) Plasmid (C) Ribosome (D) Mitochondrion

5. Human insulin is now produced by
(A) Genetically modified bacteria (B) The pancreas of animals (C) Chemical synthesis only (D) Yeast in bread

6. GM crops are plants that have been
(A) Grown without water (B) Genetically modified to resist pests or give more food (C) Grown in a laboratory only (D) Crossed with animals

7. Single-cell protein is produced from
(A) Single-celled organisms such as yeast and algae (B) Meat only (C) Seeds only (D) Milk only

8. Gene therapy aims to treat
(A) Infectious diseases (B) Inherited diseases (C) Broken bones (D) Food poisoning

9. The gas that makes bread rise during fermentation is
(A) Oxygen (B) Nitrogen (C) Carbon dioxide (D) Hydrogen

10. An ethical concern about biotechnology is
(A) The safety of GM foods (B) The colour of bread (C) The price of yeast (D) The taste of yoghurt

CHAPTER 8 — PRACTICE QUESTIONS

Biotechnology

Short Questions

Q1. Define biotechnology.

Answer: Biotechnology is the use of living organisms, cells or biological processes to make useful products for humans.

Q2. What is fermentation?

Answer: Fermentation is the breakdown of sugars by microbes in the absence of oxygen, producing products such as ethanol, carbon dioxide or lactic acid.

Q3. What is genetic engineering?

Answer: Genetic engineering is the deliberate changing of the DNA of an organism by inserting a useful gene from another organism.

Q4. What is single-cell protein?

Answer: Single-cell protein is protein-rich food produced from single-celled organisms such as yeast, algae or bacteria grown on cheap materials.

Q5. Give one benefit and one concern of GM crops.

Answer: Benefit: GM crops can resist pests or give higher yields. Concern: their long-term safety for health and the environment is debated.

Long Questions

Q1. Describe fermentation and its uses, and explain how human insulin is produced by genetic engineering.

Answer outline: Fermentation by yeast produces ethanol and carbon dioxide, used in bread making and brewing; bacterial fermentation produces lactic acid for yoghurt and cheese. For insulin, the human insulin gene is cut out, inserted into a bacterial plasmid, and the bacteria multiply and produce human insulin for treating diabetes.

Q2. Describe the applications of biotechnology in agriculture and medicine, and discuss one ethical concern.

Answer outline: In agriculture: GM crops resistant to pests and drought, and single-cell protein as food. In medicine: insulin, growth hormone, vaccines and gene therapy. Ethical concern: safety of GM foods and the question of owning or patenting living organisms.

CHAPTER 9

Diseases and Immunity

A disease is a condition in which the normal functioning of the body is disturbed. Diseases are of two main types: infectious diseases, caused by germs, and non-infectious diseases, caused by other factors such as poor diet, genes or injury. This chapter deals mainly with infectious diseases and how the body defends itself against them.

Pathogens and Infectious Diseases

Infectious diseases are caused by pathogens — bacteria, viruses, fungi and parasites. Pathogens spread through air, water, food, direct contact or vectors such as mosquitoes. Common examples are cholera and typhoid, spread by contaminated water; tuberculosis, spread through the air; malaria, spread by the female Anopheles mosquito; hepatitis, which damages the liver; and AIDS, caused by the HIV virus, which weakens the immune system.

Immunity

Immunity is the ability of the body to resist disease. Innate immunity is present from birth: the skin, stomach acid, tears and white blood cells form a first line of defence. Acquired immunity develops after exposure to a pathogen or after vaccination: special white blood cells called lymphocytes produce antibodies, which are proteins that bind to and destroy a specific pathogen. Memory cells remember the pathogen, so a second attack is met quickly — this is why we usually catch many childhood diseases only once.

Vaccination and Antibiotics

Vaccination is the introduction of a weakened or killed pathogen, or part of it, into the body so that the immune system learns to fight it without causing the disease. Vaccines protect against diseases such as polio, measles, hepatitis and tetanus. Antibiotics are medicines that kill bacteria or stop their growth; they were first discovered with penicillin. Antibiotics do not work against viruses, and their misuse can lead to resistant bacteria.

> **Remember:** Antibodies are specific — each one fights only one type of pathogen. Vaccination gives active immunity; the protection passed from a mother to her baby gives passive immunity.

Prevention and Control

- Drink clean water and eat properly cooked food to prevent cholera and typhoid.
- Use mosquito nets and remove standing water to control malaria and dengue.
- Keep wounds clean and get vaccinated on schedule.
- Complete the full antibiotic course prescribed by a doctor; never take antibiotics for a cold.

CHAPTER 9 — PRACTICE QUESTIONS

Diseases and Immunity

Multiple Choice Questions

Choose the correct answer. The answer key is given at the end of the book.

1. A disease caused by a pathogen is called
(A) Non-infectious (B) Infectious (C) Hereditary (D) Deficiency disease

2. Malaria is spread by the
(A) Housefly (B) Female Anopheles mosquito (C) Rat (D) Dog

3. Antibodies are produced by
(A) Red blood cells (B) Lymphocytes (C) Platelets (D) Plasma cells only

4. Vaccination gives the body
(A) Passive immunity only (B) Active immunity (C) No immunity (D) Natural disease

5. Antibiotics are effective against
(A) Viruses (B) Bacteria (C) Fungi only (D) All pathogens

6. AIDS is caused by
(A) A bacterium (B) The HIV virus (C) A fungus (D) A parasite

7. Hepatitis mainly damages the
(A) Kidney (B) Liver (C) Lungs (D) Heart

8. The first line of defence of the body is the
(A) Antibodies (B) Skin and mucus (C) Memory cells (D) Vaccines

9. Cholera spreads mainly through
(A) Air (B) Contaminated water (C) Mosquitoes (D) Direct touch only

10. Memory cells help the body to
(A) Forget diseases (B) Respond quickly to a second attack (C) Produce red cells (D) Digest food

CHAPTER 9 — PRACTICE QUESTIONS

Diseases and Immunity

Short Questions

Q1. What is a pathogen?

Answer: A pathogen is a disease-causing organism, such as a bacterium, virus, fungus or parasite.

Q2. What is immunity?

Answer: Immunity is the ability of the body to resist disease-causing organisms.

Q3. What is vaccination?

Answer: Vaccination is the introduction of a weakened or killed pathogen into the body so the immune system learns to fight it without causing the disease.

Q4. Why do antibiotics not work against viruses?

Answer: Antibiotics kill bacteria or stop their growth; viruses live inside body cells and are not affected by antibacterial medicines.

Q5. Name two ways to prevent malaria.

Answer: Use mosquito nets and remove standing water where mosquitoes breed.

Long Questions

Q1. Describe the human immune system, including innate and acquired immunity, and explain how vaccination works.

Answer outline: Innate immunity is present from birth: skin, mucus, stomach acid and phagocytic white cells. Acquired immunity develops after infection or vaccination: lymphocytes produce specific antibodies and memory cells, so a second attack is met quickly. Vaccination exposes the body to a harmless form of the pathogen so memory cells are ready.

Q2. Describe how infectious diseases spread and how they can be prevented, with examples.

Answer outline: Pathogens spread through air (tuberculosis), water and food (cholera, typhoid), vectors (malaria by mosquito) and contact (hepatitis, AIDS). Prevention: clean water, cooked food, mosquito control, vaccination, hygiene, and completing prescribed antibiotic courses.

CHAPTER 10

Evolution

Evolution is the gradual change in the inherited characters of a population over many generations. It explains how the great variety of life on Earth arose from common ancestors. The theory of evolution by natural selection was proposed by Charles Darwin in the 19th century.

Natural Selection

Darwin observed that living things produce more offspring than can survive, so there is a struggle for existence. Individuals show variation, and some variations help an individual survive and reproduce better in its environment. These useful characters are passed to the next generation, while less useful ones disappear. Over many generations the population changes — this is natural selection, often summarised as the survival of the fittest. A famous example is the peppered moth in England: dark moths became common when soot darkened tree trunks, because they were better camouflaged from predators.

Lamarck's Theory

Before Darwin, Jean-Baptiste Lamarck proposed that organisms change during their lifetime by use or disuse of organs, and pass these acquired characters to their offspring — for example, he thought giraffes gained long necks by stretching to reach leaves. This idea is not accepted today, because characters acquired during life are not passed on through genes.

Evidence for Evolution

- **Fossils:** remains preserved in rocks show how life has changed over millions of years.
- **Homologous structures:** organs with the same structure but different functions, e.g. forelimbs of humans, bats and whales.
- **Comparative embryology:** embryos of different vertebrates look very similar early on.
- **Biogeography:** related species are found in nearby regions, as on the Galapagos Islands.

Adaptation and Speciation

An adaptation is a character that helps an organism survive in its environment, such as the thick fur of a polar bear or the spines of a cactus. When populations of one species become separated and adapt to different environments over a long time, they may become so different that they can no longer interbreed — a new species has formed. This is called speciation.

> **Remember:** Evolution acts on populations over generations, not on single individuals during their lifetime. Variation, inherited through genes, is the raw material of evolution.

CHAPTER 10 — PRACTICE QUESTIONS

Evolution

Multiple Choice Questions

Choose the correct answer. The answer key is given at the end of the book.

1. Evolution is the change in the inherited characters of a
(A) Single organism in its lifetime (B) Population over generations (C) Fossil only (D) Habitat

2. The theory of natural selection was proposed by
(A) Lamarck (B) Mendel (C) Charles Darwin (D) Pasteur

3. Natural selection is often summarised as
(A) Survival of the weakest (B) Survival of the fittest (C) Use and disuse (D) Inheritance of acquired characters

4. Lamarck believed that acquired characters are
(A) Lost at birth (B) Passed to offspring (C) Caused by genes (D) Never useful

5. Fossils are
(A) Living organisms (B) Remains of organisms preserved in rocks (C) Homologous organs (D) Embryos

6. The forelimbs of humans, bats and whales are examples of
(A) Analogous structures (B) Homologous structures (C) Vestigial organs (D) Fossils

7. An adaptation is a character that
(A) Harms the organism (B) Helps the organism survive in its environment (C) Appears only in fossils (D) Cannot be inherited

8. Speciation is the formation of a
(A) New individual (B) New species (C) New fossil (D) New habitat

9. Variation in a population mainly arises from
(A) Use and disuse (B) Sexual reproduction and mutation (C) Fossils (D) Migration only

10. The peppered moth example shows natural selection by
(A) Camouflage (B) Speed (C) Size (D) Smell

CHAPTER 10 — PRACTICE QUESTIONS

Evolution

Short Questions

Q1. Define evolution.

Answer: Evolution is the gradual change in the inherited characters of a population over many generations.

Q2. What is natural selection?

Answer: Natural selection is the process by which individuals with variations better suited to their environment survive and reproduce more, so useful characters become common in the population.

Q3. Why is Lamarck's theory not accepted today?

Answer: Lamarck claimed characters acquired during life are passed to offspring, but acquired characters are not inherited through genes.

Q4. What are homologous structures? Give an example.

Answer: Homologous structures are organs with the same basic structure but different functions, showing common ancestry, for example the forelimbs of humans, bats and whales.

Q5. What is an adaptation?

Answer: An adaptation is a character that helps an organism survive and reproduce in its environment, such as thick fur in a polar bear.

Long Questions

Q1. Explain Darwin's theory of evolution by natural selection, using an example.

Answer outline: Organisms produce more offspring than can survive, so there is competition; individuals vary, and those with useful variations survive and reproduce better; these characters spread in the population over generations. Example: dark peppered moths became common when soot darkened tree trunks, because camouflage protected them from predators.

Q2. Describe the evidence for evolution and explain how a new species can form.

Answer outline: Evidence: fossils showing change over time, homologous structures showing common ancestry, similar vertebrate embryos, and the distribution of species. Speciation: populations separate, adapt to different environments, and over a long time become unable to interbreed, forming new species.

ANSWER KEY

MCQ Answer Key — All Chapters

Ch 1 Q1: B

Ch 1 Q2: C

Ch 1 Q3: B

Ch 1 Q4: C

Ch 1 Q5: C

Ch 1 Q6: C

Ch 1 Q7: B

Ch 1 Q8: B

Ch 1 Q9: C

Ch 1 Q10: D

Ch 2 Q1: B

Ch 2 Q2: C

Ch 2 Q3: B

Ch 2 Q4: C

Ch 2 Q5: C

Ch 2 Q6: B

Ch 2 Q7: B

Ch 2 Q8: B

Ch 2 Q9: B

Ch 2 Q10: B

Ch 3 Q1: C

Ch 3 Q2: D

Ch 3 Q3: B

Ch 3 Q4: B

Ch 3 Q5: C

Ch 3 Q6: C

Ch 3 Q7: C

Ch 3 Q8: B

Ch 3 Q9: B

Ch 3 Q10: B

Ch 4 Q1: B

Ch 4 Q2: B

Ch 4 Q3: C

Ch 4 Q4: C

Ch 4 Q5: B

Ch 4 Q6: B

Ch 4 Q7: C

Ch 4 Q8: B

Ch 4 Q9: A

Ch 4 Q10: B

Ch 5 Q1: B

Ch 5 Q2: B

Ch 5 Q3: B

Ch 5 Q4: C

Ch 5 Q5: B

Ch 5 Q6: C

Ch 5 Q7: B

Ch 5 Q8: C

Ch 5 Q9: B

Ch 5 Q10: B

Ch 6 Q1: B

Ch 6 Q2: B

Ch 6 Q3: B

Ch 6 Q4: C

Ch 6 Q5: B

Ch 6 Q6: B

Ch 6 Q7: C

Ch 6 Q8: C

Ch 6 Q9: A

Ch 6 Q10: B

Ch 7 Q1: B

Ch 7 Q2: B

Ch 7 Q3: C

Ch 7 Q4: B

Ch 7 Q5: B

Ch 7 Q6: C

Ch 7 Q7: B

Ch 7 Q8: B

Ch 7 Q9: B

Ch 7 Q10: B

Ch 8 Q1: B

Ch 8 Q2: B

Ch 8 Q3: C

Ch 8 Q4: B

Ch 8 Q5: A

Ch 8 Q6: B

Ch 8 Q7: A

Ch 8 Q8: B

Ch 8 Q9: C

Ch 8 Q10: A

Ch 9 Q1: B

Ch 9 Q2: B

Ch 9 Q3: B

Ch 9 Q4: B

Ch 9 Q5: B

Ch 9 Q6: B

Ch 9 Q7: B

Ch 9 Q8: B

Ch 9 Q9: B

Ch 9 Q10: B

Ch 10 Q1: B

Ch 10 Q2: C

Ch 10 Q3: B

Ch 10 Q4: B

Ch 10 Q5: B

Ch 10 Q6: B

Ch 10 Q7: B

Ch 10 Q8: B

Ch 10 Q9: B

Ch 10 Q10: A

> **Totals:** 100 multiple-choice questions, 50 short questions with answers, and 20 long questions with answer outlines, across 10 chapters.