

ZOO517 – ANIMAL FORM & FUNCTION II

MID TERM IMPORTANT QUESTIONS

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Admin: **BS Biological Sciences** (One place to all your solutions)

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1. Write functions of vitamins.

Vitamins are organic compounds required in small amounts for normal growth, metabolism, and maintenance of the body. Their main functions include:

1. **Act as Coenzymes in Metabolism:** Many vitamins (especially B-complex vitamins) act as coenzymes or parts of coenzymes in carbohydrate, protein, and fat metabolism. They help enzymes carry out biochemical reactions.
2. **Energy Production:** Vitamins like B₁ (Thiamine), B₂ (Riboflavin), B₃ (Niacin), and B₅ (Pantothenic acid) help convert food into energy.
3. **Growth and Development:** Vitamin A, Vitamin D, and B-complex vitamins are essential for normal growth, cell division, and tissue formation.
4. **Immune Function:** Vitamin C, Vitamin A, and Vitamin E strengthen the immune system and protect the body against infections.
5. **Antioxidant Activity:** Vitamins C and E act as antioxidants, protecting cells from damage caused by free radicals.
6. **Bone Health:** Vitamin D helps in calcium absorption and bone formation. Vitamin K is important for bone metabolism.
7. **Blood Formation:** Vitamin B₁₂ and Folic acid are necessary for red blood cell formation and prevention of anemia.
8. **Vision Maintenance:** Vitamin A is essential for normal vision, especially night vision.
9. **Blood Clotting:** Vitamin K plays a key role in the synthesis of clotting factors.
10. **Skin and Tissue Health:** Vitamins A, C, and E help maintain healthy skin and support wound healing.

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2. Write functions of Vitamin K.

Functions of Vitamin K

Vitamin K is a fat-soluble vitamin essential for blood coagulation and bone metabolism. Its major functions are:

1. **Blood Clotting (Coagulation)**

Vitamin K is required for the synthesis of clotting factors II (prothrombin), VII, IX, and X in the liver. It activates these factors by enabling γ -carboxylation of glutamic acid residues, which allows proper blood clot formation.

2. **Prevents Hemorrhage**

Adequate Vitamin K prevents excessive bleeding by ensuring normal clot formation after injury.

3. **Bone Metabolism**

It activates osteocalcin, a protein that binds calcium to the bone matrix, thereby supporting bone mineralization and strength.

4. **Regulation of Calcium Deposition**

Vitamin K helps prevent abnormal calcium deposition in soft tissues and blood vessels by activating matrix Gla proteins.

5. **Supports Cardiovascular Health**

By regulating calcium balance, Vitamin K may reduce vascular calcification and help maintain heart health.

6. **Role in Newborn Health**

Newborns are often given Vitamin K injections to prevent hemorrhagic disease of the newborn, as their natural stores are low.

3. Write functions of Liver.

1. Carbohydrate Metabolism: Maintains blood glucose by glycogenesis, glycogenolysis, and gluconeogenesis.

2. Protein Metabolism: Deaminates amino acids and converts ammonia into urea and synthesizes plasma proteins like albumin and clotting factors.

3. Fat Metabolism: Oxidizes fatty acids and synthesizes cholesterol and lipoproteins.

4. Bile Production: Produces and secretes bile for digestion and absorption of fats.

5. Detoxification: Detoxifies drugs, alcohol, toxins, and inactivates hormones.

6. Storage Function: Stores glycogen, fat-soluble vitamins (A, D, E, K), vitamin B₁₂, iron, and copper.

7. Blood Regulation: Acts as a blood reservoir and removes old RBCs through Kupffer cells.

8. Immune Function: Destroys bacteria and foreign particles from blood.

9. Heat Production: Generates heat during metabolic activities to help regulate body temperature.

4. Explain Primitive streak in birds.

The primitive streak in birds is a thickened, elongated structure that appears on the surface of the early embryo during gastrulation. It develops in the middle of the blastoderm and marks the beginning of body formation. Cells of the epiblast move inward through the primitive streak to form the three primary germ layers: ectoderm, mesoderm, and endoderm. The anterior end of the primitive streak forms Hensen's node, which plays an important role in organizing the embryo. The primitive streak also establishes the head-to-tail body axis and later gradually disappears as development continues.

5. What is gastrointestinal mobility?

Gastrointestinal mobility (or gastrointestinal motility) is the movement of the digestive tract muscles that helps in mixing and propelling food along the alimentary canal. It involves coordinated contractions and relaxations of smooth muscles, such as peristalsis and segmentation, which allow food to be digested, mixed with digestive juices, and moved from the esophagus to the stomach, intestines, and finally out of the body.

6. Explain temperature regulation in mammals.

Temperature Regulation in Mammals

Mammals maintain a constant body temperature through a process called thermoregulation, which involves balancing heat production and heat loss. The hypothalamus acts as the central thermostat, detecting changes in body temperature. When the body is too hot, mechanisms like sweating, vasodilation (widening of blood vessels), and panting help release heat. When the body is too cold, shivering, vasoconstriction (narrowing of blood vessels), and increased metabolic activity generate and conserve heat. Fur, fat, and behavioral adaptations like seeking shade or huddling also aid in temperature control. This regulation ensures that enzymatic and physiological processes function optimally despite external temperature changes.

7. What are water soluble nutrients?

Water-Soluble Nutrients

Water-soluble nutrients are vitamins and minerals that dissolve in water and are easily absorbed into the bloodstream. They include B-complex vitamins (like B₁, B₂, B₃, B₆, B₁₂, folic acid, biotin, pantothenic acid) and Vitamin C, as well as certain minerals like potassium, magnesium, and calcium in small amounts. These nutrients are not stored in large quantities in the body, so they need to be consumed regularly through diet. Excess amounts are usually excreted in urine, making toxicity less common than with fat-soluble nutrients. They play essential roles in energy production, metabolism, and overall cellular function.

8. Write functions of gall bladder.

Functions of the Gall Bladder (Detailed Bullets)

- **Stores Bile** – Holds bile produced by the liver until it is needed for digestion.
- **Concentrates Bile** – Removes water and salts to make bile stronger and more effective for fat digestion.
- **Releases Bile into Small Intestine** – During meals, bile is secreted into the duodenum to aid digestion.
- **Emulsifies Fats** – Breaks large fat droplets into smaller ones, making it easier for enzymes to act.
- **Supports Fat Absorption** – Helps the intestines absorb fat-soluble vitamins (A, D, E, K).
- **Excretes Waste Products** – Carries bilirubin, cholesterol, and other waste from the liver to be removed from the body.

9. How fishes survive in cold water or cold temperature?

How Fishes Survive in Cold Water

Fishes have several adaptations that help them survive in cold water or low temperatures:

- **Slow Metabolism** – Their metabolic rate decreases in cold water, reducing energy requirements.
- **Antifreeze Proteins** – Some fish produce antifreeze proteins that prevent ice crystals from forming in their blood.
- **Behavioral Adaptations** – Many fish move to deeper or warmer areas during extreme cold.
- **Fatty Tissue and Insulation** – Certain fish have thicker layers of fat to conserve heat.
- **Oxygen Efficiency** – Cold water holds more oxygen, which some fish exploit to maintain respiration.
- **Reduced Activity** – Fish often become less active to conserve energy during cold periods.

10. How primitive streak is formed in birds?

Formation of Primitive Streak in Birds

The primitive streak in birds is formed during early embryonic development and marks the beginning of gastrulation. Its formation involves the following steps:

- **Thickening of Epiblast Cells** – Cells in the posterior region of the area pellucida of the blastoderm proliferate and become densely packed.
- **Migration of Cells** – Epiblast cells migrate toward the midline of the embryo, forming a linear thickened structure along the anterior-posterior axis.
- **Primitive Groove Formation** – As cells move inward (invaginate), a central groove called the primitive groove appears along the streak.
- **Hensen's Node Formation** – The anterior end of the streak enlarges to form Hensen's node (primitive knot), which acts as an organizer for the embryo.
- **Establishment of Body Axis** – This process sets up the head-to-tail orientation and allows cells to move inward to form the three germ layers: ectoderm, mesoderm, and endoderm.

11. Explain digestive functions of grasshopper.

Digestive Functions of Grasshopper

The digestive system of a grasshopper is specialized for breaking down plant material and extracting nutrients. Its main functions are:

- **Ingestion and Chewing** – Grasshoppers use mandibles and other mouthparts to cut and chew leaves and plant tissues into smaller pieces.
- **Storage in Crop** – Food is temporarily stored in the crop, allowing gradual digestion.
- **Grinding in Gizzard** – The gizzard has thick muscular walls and chitinous teeth that grind food into fine particles.
- **Chemical Digestion** – Digestive enzymes from the salivary glands and midgut break down carbohydrates, proteins, and fats.
- **Absorption of Nutrients** – The midgut (or stomach) absorbs digested nutrients into the hemolymph (insect blood).
- **Excretion** – Undigested food and nitrogenous wastes are passed into the hindgut and eliminated as feces.

12. Define examples of proteins.

Proteins

Proteins are large, complex molecules made up of amino acids linked by peptide bonds. They perform a wide variety of structural, functional, and regulatory roles in living organisms, including catalyzing biochemical reactions, supporting cell structure, and regulating metabolism.

Examples of Proteins:

- **Enzymes** – Catalyze biochemical reactions (e.g., Amylase, Lipase, Pepsin).
- **Structural Proteins** – Provide support and strength (e.g., Collagen, Keratin, Elastin).
- **Transport Proteins** – Carry substances in the body (e.g., Hemoglobin, Myoglobin).
- **Hormonal Proteins** – Regulate physiological processes (e.g., Insulin, Glucagon).
- **Defensive Proteins** – Protect the body (e.g., Antibodies / Immunoglobulins).
- **Storage Proteins** – Store amino acids (e.g., Ferritin, Casein in milk).

13. Explain Teleosts excretory system in fresh water and marine water.

Teleosts Excretory System in Freshwater and Marine Water

Teleost fishes have kidneys and gills that regulate water and salt balance, but their excretory strategy differs depending on the habitat:

1. Freshwater Teleosts

- **Water Balance:** Freshwater fish live in hypotonic water, so water tends to enter their body by osmosis.
- **Excretion:** They produce large amounts of dilute urine to remove excess water.
- **Salt Retention:** They actively absorb salts through the gills and from food to maintain ion balance.
- **Kidney Function:** Kidneys conserve ions while eliminating excess water.

2. Marine Teleosts

- **Water Balance:** Marine fish live in hypertonic seawater, so water tends to leave their body by osmosis, causing dehydration.
- **Excretion:** They produce small amounts of concentrated urine to conserve water.
- **Salt Elimination:** Excess salts are actively excreted through gills and kidneys.
- **Kidney Function:** Kidneys help retain water while removing excess ions.

14. Write functions of vitamin E.

Vitamin E is a fat-soluble vitamin, mainly found in vegetable oils, nuts, seeds, and green leafy vegetables.

Functions of Vitamin E

- **Antioxidant Protection** – Protects cell membranes from damage caused by free radicals.
- **Supports Immune System** – Enhances the body's defense against infections.
- **Protects Red Blood Cells** – Prevents oxidative damage to RBCs, reducing hemolysis.
- **Skin and Tissue Health** – Aids in wound healing and maintains healthy skin.
- **Reproductive Health** – Important for fertility and normal functioning of reproductive organs.
- **Prevents Chronic Diseases** – May reduce the risk of heart disease by protecting blood vessels from oxidative stress.

15. Write a note on importance of Phosphorus.

Importance of Phosphorus

Phosphorus is an essential mineral required for various vital functions in animals. It is a key component of bones and teeth, combining with calcium to provide strength and structure. Phosphorus is also a part of ATP (adenosine triphosphate), which stores and supplies energy for cellular activities. It contributes to the formation of DNA and RNA, supporting growth, reproduction, and protein synthesis. Additionally, phosphorus is found in phospholipids, which maintain cell membrane integrity, and it helps in activating enzymes and maintaining acid-base balance in body fluids. Animals obtain phosphorus from meat, fish, eggs, dairy, and grains, making it essential for overall growth, metabolism, and health.

16. Explain stomach of ruminants.

Stomach of Ruminants

1. **Rumen:**

The rumen is the largest chamber of the ruminant stomach and serves as a fermentation vat. It contains millions of microorganisms, including bacteria and protozoa, which break down cellulose from plant material into volatile fatty acids that provide energy. Muscular contractions in the rumen mix the food and microorganisms, softening the ingested plant matter and initiating microbial digestion.

2. **Reticulum:**

The reticulum, located next to the rumen, has a honeycomb-like structure. It traps heavy or dense particles and foreign objects, preventing them from moving further into the digestive tract. The reticulum also works with the rumen to regurgitate partially digested food as cud, which the animal rechews to further break down the plant material.

3. **Omasum:**

The omasum acts as a filter, absorbing water, minerals, and some nutrients from the digested material. Its many folds reduce particle size and ensure that only finely processed material passes into the next chamber. The omasum helps in efficient nutrient extraction and prevents loss of valuable components.

4. **Abomasum:**

The abomasum is called the “true stomach” because it functions similarly to a monogastric stomach. It secretes gastric juices containing enzymes and hydrochloric acid, which digest proteins and kill microbes coming from the rumen. The abomasum completes the digestive process, making nutrients available for absorption in the intestines.

17. Define calories and average calories.

Calories (cal):

A calorie is a unit of energy that measures the amount of energy released from food when it is metabolized by the body. It represents the energy needed to raise the temperature of 1 gram of water by 1°C. In nutrition, we often use kilocalories (kcal), where 1 kcal = 1000 calories, to indicate the energy content of food.

Average Calories:

Average calories refer to the typical daily energy requirement of an individual, which depends on age, sex, body size, and physical activity. For example, the average daily calorie intake for an adult male is about 2500 kcal, and for an adult female about 2000 kcal, though these values can vary based on lifestyle and metabolic needs.

18. How fishes do osmoregulation in fresh water and marine water?

Osmoregulation in Fishes

Fishes maintain water and salt balance through osmoregulation, and the strategy differs between freshwater and marine habitats:

1. *Freshwater Fishes*

- Freshwater is hypotonic (less salty) compared to the fish's body fluids.
- Water tends to enter the body by osmosis, so freshwater fishes drink very little water.
- They produce large amounts of dilute urine to remove excess water.
- Salts lost through urine are reabsorbed by the kidneys, and salts are actively absorbed through the gills to maintain ionic balance.

2. *Marine Fishes*

- Seawater is hypertonic (more salty) compared to the fish's body fluids.
- Water tends to leave the body by osmosis, so marine fishes drink large amounts of seawater.
- They produce small amounts of concentrated urine to conserve water.
- Excess salts from seawater are actively excreted through the gills and kidneys to maintain salt balance.

19. What is predation?

Predation

Predation is an ecological interaction in which one organism, called the predator, hunts, kills, and feeds on another organism, called the prey. It is a biological relationship that helps regulate population sizes, maintain ecological balance, and drive evolutionary adaptations in both predators and prey. Predation plays a key role in energy transfer through food chains and influences the behavior, population dynamics, and survival strategies of species.

Example:

- A lion hunting a zebra.
- A frog eating insects.

20. Write role of liver in vertebrates.

Role of Liver in Vertebrates

- **Metabolism of Carbohydrates** – Maintains blood glucose by storing glycogen and performing gluconeogenesis.
- **Protein Metabolism** – Deaminates amino acids, synthesizes plasma proteins, and converts ammonia into urea.
- **Fat Metabolism** – Oxidizes fatty acids and synthesizes cholesterol, phospholipids, and lipoproteins.
- **Bile Production** – Produces bile to aid in digestion and absorption of fats.
- **Detoxification** – Removes toxins, drugs, and harmful substances from the blood.
- **Storage** – Stores glycogen, vitamins (A, D, E, K, B₁₂), and minerals like iron and copper.
- **Blood Regulation** – Acts as a blood reservoir and destroys old red blood cells.
- **Immune Function** – Contains Kupffer cells that remove bacteria and foreign particles.
- **Heat Production** – Contributes to maintaining body temperature through metabolic activity.

21. What is intracellular and extracellular digestion? Explain with examples.

Intracellular digestion is the process in which food is broken down inside the cells. In this type of digestion, cells engulf food particles through phagocytosis or endocytosis into food vacuoles, where lysosomal enzymes digest the food into simple molecules that the cell can use. This type of digestion occurs in unicellular organisms like amoeba and in simple multicellular animals like sponges.

Extracellular digestion, on the other hand, takes place outside the cells, usually in a specialized digestive cavity or alimentary canal. In this process, enzymes are secreted into the gut or lumen, where they break down complex food into smaller molecules, which are then absorbed by the cells lining the cavity. Extracellular digestion allows animals to digest larger and more complex food and occurs in organisms such as humans, earthworms, and most vertebrates.

22. Explain how vertebrates regulate temperature in extreme conditions?

Temperature Regulation in Vertebrates under Extreme Conditions

Vertebrates maintain body temperature through thermoregulation, using physiological and behavioral adaptations depending on whether conditions are extremely hot or cold.

In Extreme Heat:

- **Sweating and Panting** – Evaporation of water from skin or respiratory surfaces helps cool the body.
- **Vasodilation** – Blood vessels near the skin surface widen to release heat.
- **Behavioral Adaptations** – Seeking shade, burrowing, or becoming nocturnal to avoid heat.
- **Reduced Activity** – Animals may limit movement during the hottest part of the day.

In Extreme Cold:

- **Shivering** – Rapid muscle contractions generate heat.
- **Vasoconstriction** – Blood vessels near the skin narrow to conserve core body heat.
- **Insulating Structures** – Thick fur, feathers, or fat layers (blubber) reduce heat loss.
- **Behavioral Adaptations** – Huddling, burrowing, or migration to warmer areas.
- **Increased Metabolic Rate** – Some animals increase metabolism to produce extra heat.

23. Write role of small intestine in digestion.

Role of Small Intestine in Digestion

- **Completion of Chemical Digestion** – Digestive enzymes from the pancreas and intestinal lining break down carbohydrates, proteins, and fats into absorbable molecules.
- **Absorption of Nutrients** – Nutrients such as amino acids, glucose, fatty acids, vitamins, and minerals are absorbed through the villi and microvilli into the bloodstream and lymph.
- **Secretion of Enzymes and Hormones** – Produces enzymes like maltase, sucrase, lactase, peptidases and hormones like secretin and cholecystokinin to regulate digestion.
- **Mixing and Propulsion** – Muscular contractions (peristalsis and segmentation) mix food with digestive juices and move it along the intestine.
- **Immune Function** – Contains lymphoid tissue (Peyer's patches) that helps in defense against pathogens.

24. Write importance of magnesium.

Importance of Magnesium in Animals

- **Bone and Teeth Formation** – Magnesium is a key component of bone structure and helps maintain bone strength.
- **Enzyme Activation** – Acts as a cofactor for many enzymes involved in energy metabolism and protein synthesis.
- **Muscle Function** – Supports muscle contraction and relaxation, including heart muscles.
- **Nervous System Regulation** – Helps maintain nerve impulse transmission.
- **Energy Production** – Participates in ATP synthesis, providing energy for cellular activities.
- **Electrolyte Balance** – Helps maintain proper levels of calcium, potassium, and sodium in cells.

