

CHAPTER 5

Tissues, Organs & Organ Systems

EXERCISE — ANSWER KEY

with fully worked explanations for every question

✓ **MCQs solved** • **Short answers** • **Detailed answers**

Reference: scholareye.xyz

SECTION A

Select the correct answers — solved & explained

1. At which level of organization does gas exchange occur between the body and the environment?

- a) Organelle level in mitochondria
- b) Cellular level in alveolar cells
- c) Tissue level in epithelial tissues
- ✓ **d) Organ system level in the respiratory system**

✓ **Correct Answer: d) Organ system level in the respiratory system**

Explanation: Gas exchange with the outside environment is the job of the whole respiratory system working as a unit — airways, lungs and alveoli together bring oxygen in and remove carbon dioxide. Mitochondria (a), alveolar cells (b) and epithelial tissue (c) all take part, but none of them alone connects the body to the environment — only the complete organ system does.

2. The epithelial tissue in the stomach wall is responsible for producing:

- a) Mucus
- b) Pepsinogen
- c) Hydrochloric acid

✓ **d) All of these**

✓ **Correct Answer: d) All of these**

Explanation: The epithelial lining of the stomach contains several specialised cell types: mucous cells secrete protective mucus, chief cells secrete pepsinogen (the inactive form of the digestive enzyme pepsin), and parietal cells secrete hydrochloric acid. Since all three secretions come from epithelial cells, the correct choice is 'all of these'.

3. In the wall of the stomach, which tissue also contains blood vessels and nerves?

- a) Epithelial
- b) Muscle
- ✓ **c) Inner connective**
- d) Outer connective

✓ **Correct Answer: c) Inner connective**

Explanation: The inner connective tissue layer (the submucosa) lies just beneath the epithelium and is rich in blood vessels and a network of nerves. It nourishes the lining and helps coordinate secretion, while the muscle layer handles movement and the epithelium handles secretion/absorption.

4. In a leaf, which tissue is responsible for photosynthesis?

- a) Xylem
- ✓ **b) Mesophyll**
- c) Epidermis
- d) Phloem

✓ **Correct Answer: b) Mesophyll**

Explanation: Mesophyll is the chlorophyll-rich ground tissue that fills the inside of a leaf between the upper and lower epidermis. Its cells are packed with chloroplasts, making mesophyll the main site of photosynthesis, unlike xylem/phloem (transport) or epidermis (protection).

5. What is the primary function of the xylem tissue in a leaf?

- a) To transport sugars to other parts
- ✓ **b) To transport water to parts of leaf**
- c) To synthesize chlorophyll
- d) To control the opening and closing of stomata

✓ **Correct Answer: b) To transport water to parts of leaf**

Explanation: Xylem is the plant's water-conducting tissue. In a leaf it forms part of the vein network and delivers water and dissolved minerals from the roots to every leaf cell. Transporting sugars (a) is the job of phloem, not xylem, and stomatal control (d) is performed by guard cells.

SECTION B

Short answers

1. Enlist the levels of organization from cells to organ systems.

Cells → Tissues → Organs → Organ Systems → Organism. Similar cells group into a tissue, different tissues combine into an organ, related organs work together as an organ system, and all organ systems together make up the complete organism.

2. What are the major roles of the epithelial tissue present in the stomach?

It secretes protective mucus that shields the stomach lining from acid, produces hydrochloric acid (via parietal cells) that activates enzymes and kills ingested microbes, releases pepsinogen (via chief cells) which is converted to the protein-digesting enzyme pepsin, and forms a continuous protective/absorptive lining for the stomach wall.

3. How do the smooth muscles contribute to the stomach's function?

The stomach wall has three layers of smooth muscle (longitudinal, circular and oblique) arranged in different directions. Their coordinated, wave-like contractions (peristalsis) churn the food, mix it thoroughly with gastric juices, break it down mechanically, and push the resulting chyme onward into the small intestine.

4. What is the function of the palisade mesophyll in the leaf?

Palisade mesophyll consists of tall, closely packed, column-shaped cells lying just under the upper epidermis. They are loaded with chloroplasts, so they capture sunlight efficiently and carry out the bulk of the leaf's photosynthesis.

5. Differentiate between the following:

i. Tissue vs Organ

A tissue is a group of similar cells that work together to perform one common function (e.g. muscle tissue). An organ is a structure built from several different tissues working together to carry out a specific, more complex function (e.g. the stomach, made of epithelial, muscle and connective tissue).

ii. Root system vs Shoot system

The root system is usually underground; it anchors the plant and absorbs water and minerals from the soil. The shoot system is usually above ground and includes the stem, leaves and flowers; it carries out photosynthesis, transport and reproduction.

iii. Epidermal vs Mesophyll tissue

Epidermal tissue is the outer protective covering of the leaf; it secretes a waxy cuticle and contains stomata for gas exchange. Mesophyll tissue lies inside the epidermis and contains chloroplasts, making it the site where photosynthesis actually takes place.

iv. Palisade vs Spongy mesophyll

Palisade mesophyll cells are tall, column-shaped and tightly packed with many chloroplasts, positioned near the upper surface for maximum light capture. Spongy mesophyll cells are irregularly shaped with large air spaces between them, positioned lower in the leaf, and are mainly involved in gas exchange (with some photosynthesis).

SECTION C

Answers in detail

1. Explain the levels of organization in a multicellular organism. How does each level contribute to the overall functioning of an organism?

Multicellular organisms are built up in a step-by-step hierarchy. At the base are cells, the smallest living units, each carrying out basic life processes. Cells that are similar in structure and function group together to form tissues — for example muscle tissue or epithelial tissue — so that a job is done more efficiently than a single cell could manage alone. Different tissues then combine in fixed proportions to build an organ, such as the stomach or a leaf, which performs a specific, complex task. Several organs that cooperate on a broader job form an organ system, such as the digestive system or the respiratory system. Finally, all the organ systems work together, coordinated by the nervous and endocrine systems, to sustain the complete

organism. Each level depends on the proper functioning of the level below it, so organization allows division of labour, greater efficiency, and survival of the whole body.

2. What is a tissue level? Explain plant and animal tissues.

The tissue level of organization is the stage at which similar cells specialise and work together to perform one shared function, rather than each cell acting independently. In animals, four basic tissue types exist: epithelial tissue (covers/lines surfaces and secretes substances), connective tissue (binds, supports and carries blood vessels/nerves), muscle tissue (produces movement through contraction), and nervous tissue (carries electrical signals). In plants, tissues are broadly grouped as meristematic tissue (actively dividing cells responsible for growth) and permanent tissue, which is further divided into simple tissues (like parenchyma, collenchyma and sclerenchyma) and complex tissues (like xylem and phloem, which transport water and food respectively). In both kingdoms, tissues are the functional bridge

between single cells and fully formed organs.

3. Describe the tissue composition of the stomach. How does each tissue contribute to the digestive function of the stomach?

The stomach wall is built from four main tissue layers. The innermost epithelial layer lines the stomach cavity and contains cells that secrete mucus, hydrochloric acid and pepsinogen, directly carrying out chemical digestion and protecting the wall from self-digestion. Beneath it, the inner connective tissue (submucosa) is rich in blood vessels and nerves that nourish the lining and help regulate secretion. The thick muscular layer, arranged in longitudinal, circular and oblique fibres, contracts rhythmically to churn food and mix it with gastric juice, physically breaking it down and moving it onward. Finally, the outer connective tissue (serosa) covers and protects the stomach and reduces friction against neighbouring organs. Together these tissues let the stomach digest food both chemically and mechanically while protecting itself in the process.

4. Describe the tissue composition of the leaf. How does each tissue contribute to the functions of the leaf?

A leaf is composed of three main tissue systems. The epidermis forms the outer protective covering on both surfaces, secretes a waxy cuticle to reduce water loss, and contains stomata that regulate gas exchange and transpiration. Inside this lies the mesophyll, divided into palisade mesophyll (tightly packed, chloroplast-rich cells that carry out most photosynthesis) and spongy mesophyll (loosely arranged cells with air spaces that allow gases to circulate and reach the palisade cells). Running through the leaf are vascular tissues — xylem, which transports water and minerals from the root to the leaf cells, and phloem, which carries the sugars made during photosynthesis away to the rest of the plant. Together, these tissues let the leaf capture light, exchange gases, and distribute water and food efficiently.

All answers prepared for revision purposes. For more solved exercises and study material, visit scholareye.xyz.