



Unit 5 • Body Structure and Life Process: tissues

Give the marks for the points in the marking scheme; an answer in other words that says the same is right.

1 Key words

1. histology
2. meristem
3. cambium
4. intercalary
5. lignin
6. cilia
7. matrix
8. ligament

K • 4

Each carries 0.5 mark.

2 Label the diagram

1. dendrites
2. axon
3. node of Ranvier

4. cell body (cyton) holds the nucleus
5. myelin sheath (Schwann cells)
6. axon terminals pass the message on

K • 3

Each carries 0.5 mark.

3 Multiple choice

- i. d. meristematic tissue

K • 1

Meristematic tissue is made of actively dividing cells. Permanent tissue cells have stopped dividing.

- ii. c. cuboidal epithelium

K • 1

Cuboidal (cubical) epithelium, a single layer of cube-shaped cells, lines kidney tubules and gland ducts.

- iii. b. lateral meristem (cambium)

U • 1

The lateral meristem runs along the sides of the stem and adds new cells sideways, increasing the girth. The apical meristem adds length at the tips; the intercalary meristem lengthens internodes.

- iv. b. its single layer of flat cells is so thin that oxygen and carbon dioxide pass through quickly

U • 1

Gases pass through a wall by diffusion, and diffusion is fastest across a thin wall. A single layer of flat cells is about as thin as a living wall can be. Cilia are on the columnar cells of the windpipe, not in the air sacs.

- v. b. food carried down by the phloem can't go further and collects there

A • 1

The phloem lies in the bark, just under it; the xylem is in the wood inside. Stripping the bark cuts the phloem, so sugar coming down from the leaves piles up above the cut and the bark swells. Water still goes up the xylem, so the leaves stay green for a while; but the roots get no food, and in the end the tree dies. Never strip bark from a tree.

4 Very short answers

- a. MARKING SCHEME

K • 1

✓ Tendon.

- b. MARKING SCHEME

K • 1

✓ Platelets.



- c. MARKING SCHEME U · 1
- ✓ Its intercalary meristem, at the base of the blade near the ground, is left and keeps growing.

5 Short answers

- a. MARKING SCHEME U · 2
- ✓ The tip of the stem holds the apical meristem, whose dividing cells make the stem longer.
 - ✓ Cutting the tip removes it, so no new cells are added at the top and the stem stops growing in height.
- b. MARKING SCHEME U · 2
- ✓ Permanent: its cells have stopped dividing and have a fixed shape and job.
 - ✓ Complex: it is made of more than one kind of cell (vessels, tracheids, xylem fibers, xylem parenchyma) working together to carry water and minerals.
- c. MARKING SCHEME U · 2
- ✓ Any one difference, e.g. xylem carries water and minerals; phloem carries food (sugar) made in the leaves.
 - ✓ Any second difference, e.g. xylem carries upwards only, phloem up and down; or xylem is mostly dead cells, phloem mostly living; or vessels and tracheids against sieve tubes and companion cells.
- d. MARKING SCHEME U · 2
- ✓ Like other connective tissues, its cells are spread out in a large amount of matrix, and it links all parts of the body by carrying materials between them.
 - ✓ Its matrix, the plasma, is a liquid.

6 Long answers

- a. ANSWER K · 4
- A permanent tissue is made of cells that have lost the power to divide and have taken a fixed shape, size and job. Its cells may be living or dead. There are three kinds:
1. **Simple permanent tissue**, made of one kind of cell: parenchyma (stores and makes food; potato), collenchyma (strength with flexibility; leaf stalks) and sclerenchyma (hardness; coconut husk, seed coats).
 2. **Complex permanent tissue**, made of several kinds of cell working together: xylem (carries water and minerals up; wood) and phloem (carries food; bast).
 3. **Special tissue**, which makes or stores particular substances: glandular tissue (oils, resin, nectar; tulsi, pine) and laticiferous tissue (latex; lalupate, pipal, rubber).

MARKING SCHEME

- ✓ A tissue whose cells have lost the power to divide and have a fixed shape, size and job (living or dead).
- ✓ Simple permanent tissue, of one kind of cell: parenchyma (stores food; potato), collenchyma (strength with flexibility; leaf stalks), sclerenchyma (hardness; coconut husk).
- ✓ Complex permanent tissue, of several kinds of cell: xylem (carries water and minerals up; wood) and phloem (carries food; bast).
- ✓ Special tissue: glandular (oils, resin; tulsi, pine) and laticiferous (latex; lalupate, pipal).



1. **Covers and protects** the body and its organs from injury, germs and drying out (skin).
2. **Lines** the tubes and cavities inside the body (blood vessels, food canal, windpipe).
3. **Secretes** substances such as mucus, enzymes, sweat and hormones (glandular epithelium).
4. **Absorbs** substances, such as digested food in the intestine (columnar epithelium).
5. **Excretes** wastes (kidney tubules) and lets substances pass by **filtering** and **diffusion** (squamous epithelium of the air sacs and capillaries).
6. Ciliated epithelium of the windpipe sweeps out dust and mucus.

MARKING SCHEME

- ✓ Covers and protects the body and organs from injury, germs and drying out (skin).
- ✓ Lines the tubes and cavities inside the body (blood vessels, food canal).
- ✓ Secretes substances such as mucus, enzymes, sweat and hormones (glandular epithelium); or excretes wastes (kidney tubules).
- ✓ Absorbs substances, such as digested food (columnar epithelium of the intestine); or lets gases pass (squamous epithelium of the air sacs); or sweeps out dust (ciliated epithelium of the windpipe).

7 Think

ANSWER

HA · 2

Two things happen. First, **cell division**: the zygote divides into 2 cells, then 4, 8, 16... After about 45 rounds of doubling you would already have tens of trillions of cells. Second, **differentiation**: as the cells divide, groups of them switch on different sets of genes and become different from each other in shape and job. Some become muscle cells, some nerve cells, some skin cells. Similar cells stay together as tissues, tissues form organs, and organs form systems.

MARKING SCHEME

- ✓ Cell division: the zygote divides again and again (2, 4, 8, 16 ...) into a huge number of cells.
- ✓ Differentiation: groups of the cells become different in shape and job (muscle, nerve, skin cells) and form the tissues.

8 Activity: Feel bone and cartilage

(not marked)

WHAT STUDENTS SHOULD FIND

The tip of the nose and the outer ear bend and spring back: cartilage. The bridge of the nose, the elbow and the shin don't bend at all: bone, made hard by calcium in its matrix. Cartilage at the ends of long bones is firm but smooth and springy, so it reduces friction at the joints and absorbs shocks.

Marks by level	Knowledge	Understanding	Application	Higher ability	Total
Marks	19	11	1	2	33





Unit 5 • Body Structure and Life Process: nervous system, glands and plant hormones

Give the marks for the points in the marking scheme; an answer in other words that says the same is right.

1 Key words

1. meninges
2. cerebrospinal fluid
3. reflex
4. autonomic
5. endocrine
6. iodine
7. auxin
8. gibberellin

K • 4

Each carries 0.5 mark.

2 Label the diagram

1. pituitary gland
2. thyroid gland
3. pancreas
4. ovaries (in a woman)

5. parathyroid glands (behind the thyroid)
6. adrenal glands (on the kidneys)

K • 3

Each carries 0.5 mark.

3 Multiple choice

- i. d. dura mater, arachnoid, pia mater

K • 1

The tough dura mater lies against the skull, the arachnoid is in the middle, and the thin pia mater clings to the brain.

- ii. b. insulin

K • 1

Insulin, from the pancreas, lowers the blood sugar when it rises (glucagon raises it when it falls).

- iii. b. sensory nerve

U • 1

Sensory (afferent) nerves carry messages from the receptors to the brain and spinal cord. Motor nerves carry orders the other way. A ganglion is a cluster of nerve cell bodies, not a nerve.

- iv. b. cerebellum

A • 1

Balance and smooth coordination of movements are the cerebellum's work. Thinking and speech (cerebrum) are affected too as he drinks more, and very large amounts can even stop the medulla's control of breathing, which is how alcohol poisoning kills.

- v. a. thyroid

A • 1

The thyroid needs iodine to make thyroxine. Without enough, it swells into a goiter and makes too little hormone.

4 Very short answers

- a. MARKING SCHEME
✓ Spinal cord.

K • 1

- b. MARKING SCHEME
✓ Ethylene.

K • 1



- c. MARKING SCHEME U · 1
✓ Sympathetic nervous system.

5 Short answers

- a. MARKING SCHEME U · 2
✓ The cerebellum coordinates the movements of the muscles and keeps the body balanced (and its posture).
✓ When it is injured, this coordination fails, so movements become shaky and the person staggers or falls.
- b. MARKING SCHEME U · 2
✓ As an exocrine gland, it sends pancreatic juice (enzymes) through a duct to the duodenum.
✓ As an endocrine gland, its islets of Langerhans release insulin and glucagon straight into the blood.
- c. MARKING SCHEME U · 2
✓ Insulin lowers the blood sugar: it helps the cells take in glucose and the liver store it.
✓ Glucagon raises the blood sugar: it makes the liver release its stored sugar; their effects are opposite (antagonistic).
- d. MARKING SCHEME U · 2
✓ Any one difference, e.g. an exocrine gland has a duct; an endocrine gland has none (ductless).
✓ Any second difference, e.g. exocrine secretions go through the duct to a particular place, hormones go straight into the blood; or enzymes, sweat, saliva against hormones; or sweat and salivary glands against the pituitary and thyroid.

6 Long answers

- a. ANSWER U · 4
When the finger touches a hot object:
1. **Receptors** (nerve endings) in the skin sense the heat and start an impulse.
 2. A **sensory nerve** carries it to the spinal cord.
 3. In the spinal cord, a **connecting neuron** passes it to a **motor nerve**.
 4. The motor nerve carries the impulse to the **muscles** of the arm (the effector).
 5. The muscles contract and the hand is pulled away.

This path, receptor → sensory nerve → spinal cord → motor nerve → effector, is the **reflex arc**. The message reaches the brain only afterwards, and then we feel the pain.

MARKING SCHEME

- ✓ Receptors in the skin sense the heat and start an impulse, which a sensory nerve carries to the spinal cord.
- ✓ In the spinal cord, a connecting neuron passes it to a motor nerve.
- ✓ The motor nerve carries it to the muscles of the arm (the effector), which contract and pull the hand away.
- ✓ This path (receptor → sensory nerve → spinal cord → motor nerve → effector) is the reflex arc; the brain is not needed, so the response is very quick.



b. ANSWER

A • 4

- i. A: cerebrum; B: cerebellum; C: medulla oblongata.
- ii. A: thinking, memory, speech, the senses, consciousness and voluntary actions. B: balance, posture and the coordination of movements. C: breathing, heartbeat, blood pressure, and reflexes such as swallowing, coughing, sneezing and vomiting.
- iii. Breathing and the heartbeat can stop, so an injury to the medulla oblongata can kill a person almost at once.

MARKING SCHEME

- ✓ A: cerebrum; B: cerebellum; C: medulla oblongata.
- ✓ A: thinking, memory, speech, the senses, consciousness and voluntary actions.
- ✓ B: balance, posture and the coordination of movements; C: breathing, heartbeat, blood pressure and reflexes such as swallowing and coughing.
- ✓ An injury to C can stop breathing and the heartbeat, so it can kill a person almost at once.

7 Think**ANSWER**

HA • 2

The **sympathetic** system. Your brain treats the exam like a danger, so the sympathetic system (helped by the hormone adrenaline, section 5.3) gets the body ready for action: a faster heart and breathing to bring more oxygen and sugar to the muscles, sweating to cool you, and digestion and saliva switched down, which gives the dry mouth and the “butterflies”. A few slow, deep breaths help the parasympathetic system take over again.

MARKING SCHEME

- ✓ The sympathetic nervous system (helped by adrenaline from the adrenal glands).
- ✓ The brain treats the exam like a danger, so it gets the body ready for action: a faster heart and breathing bring more oxygen and sugar to the muscles, and digestion and saliva slow down.

8 Activity: How fast can you catch a ruler?

(not marked)

WHAT STUDENTS SHOULD FIND

Most catches are between about 10 and 25 cm (a catch at about 20 cm means about 0.2 s). Catching the ruler is not a reflex: you must see it fall, and your brain must decide and send the order to your fingers, which takes several times longer than a spinal reflex such as the knee jerk.

See it at Science Playground

Exhibits and plants at the center, Bhaktapur, that go with this unit. Book a class visit at science-playground.com/booking.

- **Touch-Me-Not Plant** (exhibit): Brush a leaf and it folds in seconds: a response to touch made by water, not by growth.
- **Flame Vine** (garden): Find the flame vine’s tendrils coiled round their supports: growth that answers touch.

Marks by level	Knowledge	Understanding	Application	Higher ability	Total
Marks	11	14	6	2	33

