

## 28400 - Cytology and histology

### Syllabus Information

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**Academic Year:** 2020/21

**Subject:** 28400 - Cytology and histology

**Faculty / School:** 105 - Facultad de Veterinaria

**Degree:** 451 - Degree in Veterinary Science

**ECTS:** 8.0

**Year:** 1

**Semester:** Annual

**Subject Type:** Basic Education

**Module:** ---

## 1.General information

### 1.1.Aims of the course

The general goal of "Cytology and Histology" is to study the structure and ultrastructure of cells and tissues and their organization to form various organs, grouped in turn into systems and apparatus in the animal organism.

The course takes part of the Basic Training Module and continues with the training process initiated with Anatomy, by developing the animal organism knowledge at a microscopic level

### 1.2.Context and importance of this course in the degree

Students will gain a thorough understanding to approach the study of other subjects of the Degree such as Physiology, Pathological Anatomy and other Pathologies

### 1.3.Recommendations to take this course

Basic knowledge of Anatomy, Biology, Chemistry and Biochemistry.

In order to carry out practical activities, safety recommendations must be followed, which must be taken into account. Students have all the information available in the following links, as well as in the ADD courses of each of the subjects:

<https://veterinaria.unizar.es/estudiantes/formacion-prevencion-riesgos-y-seguridad#normas>

<https://veterinaria.unizar.es/prevencion/protocolosespecificosveterinaria>

<http://patologiaanimal.unizar.es/medidas-de-seguridad>

## 2.Learning goals

### 2.1.Competences

On successful completion of this course, students will be able to:

1. Know the structure of cells and identifying their organelles.
2. Understand the functions of these organelles and how they relate to each other in order to carry out all functions of each cell.
3. Know the microscopic organization of the organs that form apparatuses and systems of an animal organism.
4. Observe and identify cells, tissues and organs at a microscopic level in different histological preparations, recognise and describe the main structural singularities that define them.
5. Communicate their knowledge in a correct and effectively way.
6. Proper management of necessary means for the study of the subject.

### 2.2.Learning goals

If students complete the course successfully, they should be able to

1. Use correctly the basic terminology of Cytology, Histology and Microscopic Anatomy
2. Identify the structural and ultra-structural characteristics of cells.

3. Know the organelles functions and other cellular structures, relating them to each other and understand their necessary coordination for the cell to carry out its tasks.
4. Describe components and characteristics of the different tissues.
5. Know the disposition and microscopic organization of tissues to form the organs, apparatuses and systems of the animals, object of study of the veterinarian professional.
6. Acknowledge the meaning and fundamentals of basic histological sample preparation techniques
7. Recognize and differentiate the basic methods of microscopic staining and observation.
8. Use properly the optical microscope for observation of histological slices.
9. Recognize and differentiating cells, tissues and animal organs under the optical microscope, and how to describe them.
10. Obtain and correct use of bibliographic information related to the subject

### 2.3.Importance of learning goals

In Veterinary Medicine studies, it is necessary to know the animal organism for both health maintenance and disease treatments

## 3.Assessment (1st and 2nd call)

### 3.1.Assessment tasks (description of tasks, marking system and assessment criteria)

The student must demonstrate that has achieved the intended learning outcomes through the following assessment activities

The evaluation of learning results number 1, 2, 3, 4, 5 and 10 will be carried out by means of 2 theoretical exams (1st and 2nd partial). During the course there will be continuous assessment tests of the theoretical part.

Learning results number 1, 6, 7, 8, 9 and 10 will be evaluated through 2 practical exams (images and microscope).

#### 1. Theoretical examinations

Both the continuous assessment tests and the partial exams will consist of short answer, true / false, essay or multiple choice questions.

The maximum mark obtained with the continuous evaluation will suppose a maximum of 80% of the theoretical final mark. Students who do not want or cannot do continuous assessment, or who wish to increase the mark obtained by this system, must demonstrate their knowledge through theoretical exams.

In January / February there will be the first partial elimination theoretical exam. Students who do not pass it may appear again at the 1st official call.

The sum of the score obtained from both theoretical exams will represent 60% of the final grade, but each partial exam must be passed individually to pass the course. Students who pass any of the theoretical partial exams but fail to pass the subject in the 1st official call will obtain a failing grade, but the grade will be saved for the second official call.

#### 2. Practical examinations

Two types of compulsory practical exams will take place:

2.1. Practical examination with images. Histological images will be projected to be identified by the student, this type of examination will take place twice a year and each of them will be marked from 0 to 10 points. Students who have not been able to take any of these exams during the academic year or who have not obtained the required minimum mark (10 out of 20 points), they will have to take it on the day of the final assessment.

There will be 2 types of mandatory practical exams:

2.1. Practical exam with images. It will consist of the projection of histological images that the student must identify. There will be 2 exams of this type during the course, the first coinciding with the first theoretical partial exam and the second in the month of May. Students who have not been able to take any of these exams during the school period or who have not obtained the minimum required grade (10 out of 20 points), must take a new practical exam with images on the day of the final exam. will include all those studied during the course. The score obtained will represent 20% of the final grade

2.2 Practical examination with microscope. In this exam, each student will receive 4 histological preparations that must be observed under the microscope, identifying the tissue or organ in question and making a brief histological description of them. Each preparation will be valued on 5 points. The minimum score necessary to pass this exam will be 10 points. The score obtained will represent 20% of the final grade.

Students who pass any of the 2 practical exams but fail to pass the subject in the first official call will receive the qualification of suspense, but they will save the grade for the second call and if necessary for the next course.

#### Examinations for non-attendance students or those who do not take them on first season

Non-attendance students will have to take a final assessment, which will consist of a theoretical exam (which has 2 partial exams) and a practical one (images and microscopes). They will also have to undertake an additional practical exam that replaces the practice. I

For students who appear in other calls different from the first, the evaluation, assessment criteria and level of demand will be the same as in the first call.

## Examination Schedule

Dates and times of the first and second season final exams are publicly available on :

<https://veterinaria.unizar.es/examenesvet>

Dates for partial and practical exams will be released along the academic year.

## Assessment criteria

Valuation criteria and requirement levels

To pass the course, it is necessary to carry out at least 85% of the practicals and pass each of the exams separately (first theoretical part, second theoretical part, practical exam with microscope and practical exam with images).

The final mark is obtained by:

\* The average of the theoretical exam marks (up to 60 points).

\* Marks of practical exams (up to 40 points)

## Marking system:

According to the national regulation Law 1025/2003, 5th of September which lays down the European system of credits and marking system for the university degree.

0-4,9: FAIL.

5,0-6,9: PASS

7,0-8,9: GOOD (NT).

9,0-10: EXCELLENT (SB).

As the article 158 of the Statutes of the University of Zaragoza lays down, provisional grades will be displayed at least for 7 days and students will be able to review them on the date, time and place provided for that purpose.

## 4. Methodology, learning tasks, syllabus and resources

### 4.1. Methodological overview

The learning process that has been designed for this course is based on the following activities:

a) Lectures: The topics tackled in this course will be presented, explained and discussed in 50 minute lectures where ppt presentations will be used for image support.

b) Seminars: At the beginning of course a seminar will be held where the Histological Technique will be explained. Students will also observe, comment and discuss electron microscopy images corresponding to the theoretical classes of Cytology.

c) Laboratory practice: Parallel to the theory small-group practical classes will be held, where the student will observe histological preparations of various tissues and organs using optical microscopes. Each student must take 16 practices, 1.5 or 2-hour duration, in the Histology laboratory. The existence of more than 3 unexcused absences from these classes implies that the student will go directly to practical final exam.

d) Continuous Assessment: During the first 15 minutes of each practice session, students will take a written test in which the theoretical part developed in the previous practice will be evaluated, with the following contents:

First partial

No. 1. Continuous Assessment Cytology

Num. 2. Continuous Assessment of Epithelial I

Num. 3. Continuous Assessment of Epithelial II

No. 4. Continuous Assessment of Connective Tissue

No. 5. Continuous Assessment of Cartilaginous and Bone Tissue

No. 6. Continuous Assessment of Muscle Tissue

Num. 7. Continuous Assessment of the Nervous System

Num. 8. Continuous Assessment of Circulatory and blood

Second partial

Num. 9. Continuous Assessment of Hematopoiesis and Lymphoid Organs

Num. 10. Continuous Assessment of Digestive I

Num. 11. Continuous Assessment of Digestive II

No. 12. Continuous Assessment Respiratory System

No. 13. Continuous Assessment of Urinary System

No. 14. Continuous Assessment of Reproductive System

No. 15. Continuous evaluation of skin, eye and ear

e) Tutorials: Students will be able to meet teachers to consult issues related to the subject. Dates and times should be agreed by email in advance.

Selected supporting materials will be provided in the Moodle Digital Platform: <https://moodle2.unizar.es/>

### 4.2. Learning tasks

The program that is offered to the student to help him to achieve the expected results includes the following activities...

1. Lectures on the contents shown in the course syllabus.
2. Laboratory practical classes with the following contents:
  2. Epithelial tissue (I)

1. Epithelial tissue (II)
2. Connective tissue
3. Cartilage and bone
4. Muscle tissue
5. Nervous system
6. Cardiovascular system
7. Endocrine system
8. Respiratory system
9. Digestive system (I)
10. Digestive system (II)
11. Lymphoid Organs
12. Urinary system
13. Reproductive system
14. Review (I)
15. Review (II)

In the review practices students will have at their disposal all histological preparations that have been used in previous practices along the course. The teacher responsible for the course will offer support and answers to the questions raised in the review.

### 4.3.Syllabus

#### Introduction

Unit 1. Cytology and Histology concept. Historical perspective. Spanish School of Histology. Histological methods: microscopy, electron microscopy, histochemistry, immunocytochemistry.

#### Cytology

Unit 2. Introduction to cell study. Cell Theory. General concepts: prokaryote and eukaryote cells. Observation of fixed and stained cells.

Unit 3. Plasma membrane: structural model and chemical composition. Properties and functions. Molecular transport. Endocytosis and exocytosis.

Unit 4. Ribosomes. Endoplasmic reticulum: ultrastructure and varieties: granular (rough) and agranular (smooth) endoplasmic reticulum. Functions.

Unit 5. The Golgi complex: ultrastructure. Functions. Cellular secretion. Unit 6. Lysosomes and peroxisomes: ultrastructure. Functions.

Unit 7. The mitochondria: ultrastructure. Functions.

Unit 8. The cytoskeleton: microtubules, microfilaments and intermediate filaments. Ultrastructure and organization. Functions. Cytoplasmic Inclusions. Hyaloplasm.

Unit 9. The nucleus: general characteristics: shape, number, position and general structure. Nuclear envelope. Nuclear pores. Chromatin. Nucleolus. Nucleoplasm.

#### General Histology

Unit 10. Animal Tissues: concept. Tissue differentiation and renovation. Tissue classification. Epithelial tissue. Structural and functional characteristics. Cellular polarity: apical, lateral and basal surfaces. Epithelial classification. Lining epithelia types. Glandular epithelia and glands. Epithelial cell renewal.

Unit 11. Connective tissue: structural and functional characteristics. Classification. Cells and extracellular components. Adipose tissue.

Unit 12. Cartilage: structure. Classification. Hyaline cartilage. Elastic cartilage. Fibrous cartilage. Origin and growth of cartilage.

Unit 13. Bone: general characteristics. Classification. General structure of bones. Cellular and matrix components of Unit 14. The blood: Study techniques. Erythrocytes, leukocytes, platelets. Morphological variations, structure and chemical composition. Differences in various animal species. The bone marrow. Hematopoiesis.

Unit 15. Muscle tissue: Types. Skeletal muscle. Types of muscle fibers. Muscle-tendon junctions. Cardiac muscle. Smooth muscle. Regeneration of muscle tissues.

Unit 16. Nervous tissue: general characteristics. Neurons: structure and ultrastructure. Classification of neurons. Nerve fiber: myelinated and unmyelinated nerve fibers. Degeneration and regeneration of nerve fibers. Interneuron synapses. Neuroglia.

#### Microscopic Anatomy

Unit 17. Nervous system: general organization. Central nervous system: the brain. Structure of isocortex. White matter. Cerebellum. Cellular organization of cerebellar cortex. White matter. Spinal cord: white and gray matter. Meninges. Ependyma. Choroid plexuses. Peripheral nervous system: peripheral nerves. Dorsal root ganglia.

Unit 18. The cardiovascular system: arteries. Arteriolar-venous anastomosis. Capillaries. Chemoreceptors and baroreceptors. Veins. Venous circulation and valves. The heart: cardiac skeleton. Cardiac valves. Lymphatic vessels.

Unit 19. Lymphoid organs: general characteristics. Primary lymphoid organs: the thymus and the bursa of Fabricius. Secondary lymphoid organs: lymph node, the spleen, hemolymph nodes.

Unit 20. The digestive system: the buccal cavity, tongue, teeth, lips and palate. The pharynx. The salivary glands. The digestive tube: general structure: the esophagus, the glandular stomach, the compound stomach, the small intestine, the large intestine. The Peritoneum. The liver and gallbladder. The exocrine pancreas. The avian digestive system.

Unit 21. The Respiratory system: components and structural organization: the nasal cavity, the larynx, the trachea, the lung, the pleura. The Avian respiratory system, and the air

Unit 22. The urinary system: the kidney. Differences among domestic species. General structure. The nephron. Collecting duct system. Juxtglomerular complex. Blood supply of kidney. Lymphatic vessels. Renal pelvis. The ureters. The urinary bladder. The urethrae.

Unit 23. The Endocrine system: peripheral diffuse endocrine system. Hypophysis and epiphysis cerebri. The thyroid, parathyroid and adrenal glands. The endocrine pancreas.

Unit 24. The male reproductive system: general characteristics. The testes: structure and functions. The epididymis. The ductus deferens. The Accessory glands: vesicular, prostate and bulbourethral glands. The penis.

Unit 25. The female reproductive system: the ovary, the oviduct, the uterus and the vagina. The avian reproductive system. The mammary gland.

Unit 26. The integumentary system: the skin: epidermis and dermis. Hair follicle. Hair structure.

Unit 27. The eye: structure of eyeball and eyelid. The ear: general structure.

#### **4.4.Course planning and calendar**

The timetable and schedule of lectures and practical classes can be found at:

<https://veterinaria.unizar.es/horarios1vet>

The composition of the groups for the practical classes will be published in the unit bulletin board at the beginning of the course.

On the website of the Faculty of Veterinary Medicine (<https://veterinaria.unizar.es/academico/plan-estudios-grado-veterinaria>) detailed information is offered about the different activities programmed for this course and the corresponding deadlines.

#### **4.5.Bibliography and recommended resources**

<http://psfunizar7.unizar.es/br13/egAsignaturas.php?codigo=28400>