Department of Biology

College of Education

Salahaddin University

Subject: Introduction to Animal Physiology-theory

Course Book – (Year 3)

Dr. Karim Rahman Hamad

Academic Year: 2022-2023

Course Book

1. Course name	**Animal Physiology-theory**
2. Assistant professor in charge	**Dr.Karim Rahman Hamad**
3. Department/ College	**Biology/Education**
4. Contact	**e-mail: karim.Hamad@su.edu.krd** **Tel: (optional)**
5. Time (in hours) per week	**Theory: 4** **Practical: (6 hr. supervising)**
6. Office hours	**3 hr**
7. Course code	
8. Teacher's academic profile	I graduated in department of biology/college of education /Salhaddin University - in 1986, master science in animal physiology in 1995, and PhD in animal physiology in 2006.I began my work as a teacher in biology department /college of education in 1995.Since that time and up to now I interested in teaching of animal physiology, endocrinology, Neurophysiology, Comparative anatomy of chordates, and General zoology to undergraduate students. Also Endocrinology, Cell metabolism, and Cell physiology to post graduate students. In addition, supervising of one diploma student, and five MSc. Students in animal physiology. In order to improvement the quality of study, I wish to give my lectures and treat the students according to psychological guidance, application of principles of education and appropriate teaching method. I have no doubt that on the bases of this philosophy the caravan of science and education oriented to wards the bright future of our society. I have four published papers in my field of speciality, and participated by two papers in scientific conferences. Since 2010 continueously I prepare seminars in physiology and related sciences to delivery on staff members of biology department or college of education. The biologist is in a great need to other fields of science. So continueously I enrich my knowledge in chemistry, physics, etc. Even I have some idea to study some aspects of psychology and sports, meanwhile I want to investigate them with assistance of my collages.
9. Keywords	

10. Course overview:

Animal physiology focuses on the function of the tissues, organs, and organ systems of multicellular animals. The animal physiologist attempts to understand in physical and chemical terms the mechanisms that operate in living organisms at all levels, ranging from the subcellular to the integrated whole organism. Understanding how animals work requires detailed knowledge of the molecular interactions that set the stage for cellular processes. Armed with this knowledge, animal physiologists design experiments and test hypotheses to learn about the control and regulation of processes within groups of cells, and how the overall activities of these cell groups then affect the overall function of the animal. The coordinated activities of cells, collected into specialized organs, provides the basis for the behavioral capabilities and physiological processes that distinguish animals from plants. These distinguishing features include movement, relative independence from environmental conditions, sophisticated sensory information about the world, and complex social interactions. Above a1l, animal physiology is an integrative science. Physiologists examine and try to understand how physiological systems (usually in the central nervous system) sort through and differentiate between the vast amounts of information about the external and internal environment typically received by an animal. For example, the seemingly straightforward process of a mammal maintaining a stable body temperature requires the temperature-control system of the brain to integrate information on the multitude of factors affecting body temperature: the heat load or heat sink presented by the external environment; the rate of heat production by metabolically active tissues; the transport of heat by blood flow between the body core and its periphery; the contribution of evaporative cooling; the insulative nature of its fur; and many other such physiological and anatomic variables. It is this theme of integration that sets physiology apart from other sciences-adding to its complexity but also to its fascination. Physiology is firmly rooted in the laws and concepts of chemistry and physics. our background in these disciplines will greatly help us learn about and understand animal physiology

Animal physiology studies have yielded knowledge central to many commercial and agricultural advances during the last few decades. Veterinarians, for instance, now can offer veterinary care that in many instances rivals the medical treatment available to humans. Farmers have been able to improve the yield and quality of the milk, eggs, and meat they produce. And improved breeding techniques now include widespread use of artificial insemination.

In fact, most of what we have learned about the function of human cells, tissues, and organs was known first (or is still only known) through the study of various species of vertebrate and invertebrate animals. Animal physiology, especially as it appLies to the human body, is the cornerstone of scientific medical practice. Understanding of the functioning and malfunctioning of living tissue provides the foundation for developing effective, scientifically sound treatment for human disease. The contributions of animal physiology to medicine have been greatly expanded by new techniques for generating unique animal models for specific human diseases (e.g., diabetic mice, congenitally fat rats, zebrafish embryos with heart defects).

Finally because of the scientific nature and location among biological sciences, physiology play important role to secure employment .

11. Course objective:

Through the courses of study I tend to make the students to understand cell physiology and systems including Nervous system, Muscular system, cardiovascular system , respiratory system, circulatory system, urinary system, reproductive system, and endocrine system. And interaction or relationship between them. First the student will learn the meaning of physiology and its definition and locations among biological sciences. Then why physiology is considered as an experimental science, So step by step by depending on appropriate method lectures are given to students. So by this way progress the scientific ability of the students and enrich them with recent and contemporary information, leading to prepare teacher of our future for secondary and preparatory schools in the Kurdistan region.

12. Student's obligation

Throughout the academic year students have to read and understand their lectures and . prepare themselves to quiz and monthly examinations. of course I oblige the students to attendance and completion of tests and examinations.

13. Forms of teaching

The lectures are given to students by means of power point presentation with discussion method. In addition, other means can be used as black board and white board to explain lectures.

14. Assessment scheme

Examinations (90 marks), with some quize examinations and activities (10 marks)

15. Student learning outcome:

The aim of our work and efforts is, how we make the student to learn principles of animal physiology, in order to secure employment. Indeed the students in our college are graduated as teachers of biology to serve in schools of ministry of education in Kurdistan region.

16. Course Reading List and References:

1- Costanzo,L.S.(2014). Physiology.5th edition. Saunders,elsevier.
2-Fox,S.I.(1991). Perspectives on Human Biology.WCB publisher
3-Guyton,A.C. and Hall, J.E.(2011).Textbook of Medical Physiology.12th edition. Saunders elsviere.
4- Hill, R.W., Wyse, G.A. and Anderson, M (2012). Animal Physiology.3rd edition. Sinauer Associates, Inc. Publishers • Sunderland, Massachusetts
5- Moyes,C.D.and Schulte,P.M.(2014).Principles of Animal Physiology.2nd edition.Pearson.
6- Sherwood, L. , Klandorf, H. and Yancey, P.H.(2005). Animal Physiology from gens to organisms. Thomson,Brooks/col.
7- Randall,D., Burggren, W. and French, K.(2000). Eckert Animal Physiology, mechanisms and adaptations. 4th edition. W.H.Freeman and company.
8- Saladin,K.(2018). Anatomy and Physiology.8th edition. The McGraw−Hill Companies,
9- Seeley,Stephens and Tate.(2004). Anatomy and Physiology,6th edition. The McGraw−Hill Companies.
10-Vander,A., Luciano,D.and Sherman,J. (2001). Human Physiology. The Mechanism of Body 8th edition. Mc Graw Hill Companies.

17. The Topics:	Time of each lecture=2hr

Syllabus of animal physiology-theory -1st semester

Week l: Physiology, Means of research in animal physiology, Cell membrane, Transport across Cell membrane, 1-Simple diffusion, 2- Osmosis, Questions.
Week2: 3- Carrier-mediated transport, Facilitated diffusion, Active transport, Primary active transport, Secondary active transport, Vesicular Transport, Phagocytosis, Pinocytosis, receptor-mediated endocytosis, Exocytosis, Functional Classification of Intercellular Chemical Signals,1-Autocrine,2-Paracrine,3- Endocrine ,4-Neurotransmitters ,5-Pheromones Questions.
Week 3: Membrane potential, Resting membrane potential, Resting membrane potential, Nernst equation, Graded Potentials and Action potentials, Graded potentials ,Action potentials, Refractory periods , ,Questions
Week 4 Signal conduction in nerve fibers: in unmyelinated nerve fibers , in myelinated fibers, Difference between graded potentials and action potentials , Synaptic transmission, Structure of the synapse, Mechanism of synaptic transmission, Neurotransmitters and Neuromodulators, 1-Acetylcholine (Ach), Questions.
Week 5: 2- Biogenic amines ,3- Amino Acids 4- Neuropeptides, Nervous system , Functional classes of neurons, Properties of neurons, Structural diversity in neurons ,Types of neuroglia, Neuroglia in CNS, , Questions.
Week 6: Neuroglia in PNS, Sensory Areas of the Cerebral Cortex, Motor Areas of the Cerebral Cortex, Cranial Nerves, Spinal Nerves, Questions.
Week 7: Neuronal pathways, Convergent pathways, Divergent pathways, Reflexes, The pain-withdrawal reflex, knee-jerk (patellar) reflex, The crossed extensor reflex, Visceral Reflexes, Questions.
Week 8: Photopupillary reflex, Micturition reflex, Defecation reflex, Conditioned reflex, Conditioned salivation reflex, Conditioned Eye-Blink Reflex, Milk-Letdown Reflexes, Questions.
Week9:Exam.
Week 10: Autonomic nervous system, Enteric nervous system (intrinsic innervations), Effects of autonomic nervous system, Questions.
Week 11: Digestive system , Mechanical digestion ,Chemical digestion , Saliva and the Salivary Glands, Carbohydrate digestion in the mouth, In small intestine , Monosaccharide absorption by the Small Intestine , Gastric digestion , Hydrochloric acid secretion by gastric parietal cells ,Protein digestion and absorption, Small intestine , Actions of pancreatic enzymes, Questions.
Week 12: Actions of brush border enzymes, Regulation of bile output, Fat digestion and absorption, The major functions of liver, Questions.
Week 13: Skeletal muscle physiology, Muscle fiber, Molecular characteristics of the contractile filaments, Myosin filament, Actin filament, Tropomyosin molecules, Troponin, Sliding filament mechanism, Functions of ATP in skeletal-muscle contraction, Questions.
Week 14: Energy sources and metabolism, Cori cycle, Smooth muscle, Smooth muscle contraction, Types of Smooth Muscle, Multiunit smooth muscle, Single unit smooth, Questions.

18. Practical Topics (If there is any)	

19. Examinations:

1. Compositional:

1- What is the difference between experimental sciences and descriptive sciences ?

2- give one example in histochemistry

3- Compare between graded potentials and action potentials

2. True or false type of exams:

1- Anaxonic neurons are found only in the brain

2- Brain cancer is produced from mitotic divisions of neurons

3- in phase 2, isovolumetric contraction, The AV valves close and heart sound S1 occurs.

3. Multiple choices:

(choose the correct answer)

1- K^{42} is used in the study of a- nerve impulse b- thyroid hormones c- insulin d- protein synthesis

2- The highest density of voltage gated ion channels is found on the----------of a neuron.

a- dendrites b-soma c-nodes of ranvier d-internodes

3- The resistance in aorta is a- 1 R unit b- 2 R unit c- 3 R unit d- 4 R unit

20. Extra notes:

To enrich the course book, I suggest rearrangement of course book according to suggestions of staff members of department s in the colleges

21. Peer review **پێداچوونەوەی هاوەڵ**

This course book has to be reviewed and signed by a peer. The peer approves the contents of your course book by writing few sentences in this section.

(A peer is person who has enough knowledge about the subject you are teaching, he/she has to be a professor, assistant professor, a lecturer or an expert in the field of your subject).

ئەم کۆرسبووکە دەبێت لەلایەن هاوەڵێکی ئەکادیمیەوە سەیر بکرێت و ناوەرۆکی بابەتەکانی کۆرسەکە پەسەند بکات و جەند ووشەیەک بنووسێت لەسەر شیاوی ناوەرۆکی کۆرسەکە و واژووی لەسەر بکات.

هاوەڵ ئەو کەسەیە کە زانیاری هەبێت لەسەر کۆرسەکە و دەبیت پلەی زانستی لە مامۆستا کەمتر نەبێت.