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MINISTRY OF HIGHER EDUCATION, SCIENCE, AND TECHNOLOGY
UNIVERSITY OF LAMPUNG
FACULTY OF TEACHER TRAINING AND EDUCATION

Jl. Prof. Dr. Sumantri Brojonegoro No.1 Gedong Meneng - Bandar Lampung 35145

Tel./Fax: (0721) 704624 e-mail : fkkip@unila.ac.id, page: <http://fkkip.unila.ac.id>

MODULE DESCRIPTION

Module name	Animal physiology
Module level, if applicable	Bachelor of Biology
Code, if applicable	KB0620209
Subtitles, if applicable	Animal physiology
Semester(s) in which the module is taught	IV
Person responsible for the module	Lecturer of Courses
Lecturer	1. Dr. Tri Jalmo, M.Si 2. Dr. Dina Maulina, M.Si. 3. Ismah Fathimah, M.Pd.
Language	Bilingual (Bahasa and English)
Relation to Curriculum	This course is a compulsory course taken in semester 4th
Type of teaching, contact hours	Contact hours: 16 weeks x 150 minutes Structured learning: 16 weeks x 180 minutes Independent study: 16 weeks x 180 minutes Practicum sessions: 16 weeks x 255 minutes
Teaching methods	Lectures, Practicum
Workload	Contact hours: 16 weeks x 150 minutes
Credit points	3 sks = (3*128) = 3.84 ECTS
Requirements according to the examination regulations	Students must meet minimum of 80% attendance
Recommended prerequisites	Animal Structure and Vertebrate Zoology
Module objectives/intended learning outcomes	Analyzing the bioprocesses that occur in animals in carrying out life processes in their environment
Content	1. Introduction and cell structure and function 2. Osmoregulation and Comparative Osmoregulation 3. Animal nutrition and digestion 4. Transport and circulation of blood 5. Respiration and gas exchange 6. Animal adaptation and body defense 7. Internal environment control 8. Chemical signals in animals 9. Nervous system 10. Sensory and motor mechanisms 11. Animal reproduction
Forms of Assessment	Assessment is carried out based on written examinations, assessment/evaluation of the learning process and performance with the following components: Structured tasks: 30%; Mid Test: 20%; Final Test: 20%; Practicum 30%
Study and examination requirements and	1. Study and examination requirements: 2. Students must attend 10 minutes before the class starts.

forms of examination	- Students must switch off all electronic devices. - Students must open a camera and mute microphone during online class unless they must discuss or answer questions - Students must inform the lecturer if they will not attend the class due to - sickness, etc. - Students must submit all class assignments before the deadline. - Students must attend the exam to get a final grade. Form of examination: Written exam: Essay
Media employed	Powerpoint Presentation, laptop/ pc, projector; V Class UNILA (G-meet atau zoom); E book.
Reading list APA 2018	Primary: - Hill, RW&G.A Wyse and Anderson. 2008. <i>Animal Physiology</i>. NY: Harper & Row pb - Kartolo Wulangi. 1993. <i>Principles of Animal Physiology</i>. Jakarta: Directorate General of Higher Education - Moyes, CD and PM Schulte. 2006. <i>Principles of Animal Physiology</i>. San Francisco : Pearson Education Inc. - Soewolo.2000. <i>Introduction to Animal Physiology</i>. PPGSM Dikti - Meti Indrowati and Sumanto. 2007. Textbook of Animal Physiology. - Guyton, AC & Hall. 2010. Medical Physiology. ECG Medical Book Publisher, Jakarta - Campbell, NA, Rece, JB, Michel LG Biology, 5th edition, Volume 3. Publisher: Erlangga - Prosser, C.L. Environmental and Metabolic Animal Psycologi: Comparative animal Phyology, Wiley-Liss, Inc. Publication. New York- USA - Pearce, E. 2006. AnatomidanFisiologiuntukParamedis. PT. Gramedia. Jakarta - Schmidt-Nielsen, Knut. 1998. AnilmalPsylogy : Adaptation and Environtment, 5th edition. Cambride University Press, USA. 612p - Jalmo, T., & Maulina, D.2023. Fisiologi Hewan. Pustaka Media, Bandar Lampung. - Derrickson, B. H. 2019. Human Physiology (Loose-leaf). John Wiley & Sons. Supporters: - OpenStax. 2022. <i>Anatomy and Physiology 2e</i>. OpenStax, Rice University. - Aspinall, V. & Cappello, M. 2024. <i>Introduction to Animal and Veterinary Anatomy and Physiology</i> (5th ed.). CABI. - Urry, L. A., Cain, M. L., Wasserman, S. A., Minorsky, P. V., & Orr, R. B. 2021. <i>Campbell Biology (12th ed.)</i>. Pearson. - Silverthorn, DU (2020). <i>Human Physiology: An Integrated Approach</i> (6th ed.). EGC Medical Book Publishers. - Maulina, D., Priadi, MA, Lengkana, D., Jalmo, T., Fauzisar, AS, & Amin, M. 2020. Book of insects' immune system: development and implementation with PBL in increasing students' learning outcome. <i>Biosfer: Jurnal Pendidikan Biologi</i>, 13(1), 42-58. https://doi.org/10.21009/biosferjpb.v13n1.42-58

	6. Maulina, D., Sumitro, SB, Lestari, SR, & Djoa, DD 2025. <i>Spodoptera litura</i> F. immune system against exposure to the biopesticide <i>Mirabilis jalapa</i> L. <i>AGRIVITA Journal of Agricultural Science</i> , 47(1), 11-20. http://doi.org/10.17503/agrivita.v47i1.4351
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Course Program

COURSE CONTRACT

Course Identity

Course Title	Animal Physiology
Course Code	KB0620209
Semester	IV
Credits	3 SKS ($\approx$ 3.84 ECTS)
Status	Compulsory
Prerequisites	Animal Structure and Vertebrate Zoology
Study Program	Biology Education
Lecturer	1. Dr. Tri Jalmo, M.Si 2. Dr. Dina Maulina, M.Si. 3. Ismah Fathimah, M.Pd.
Course Description	This course aims to provide knowledge about the basic concepts of physiology which includes: introduction and cell structure and function, osmoregulation and comparative osmoregulation of nutrition and animal digestion. Transport and blood circulation respiration and gas exchange, animal adaptation and body defense, control of internal environment, chemical signals in animals, nervous system, sensory and motor mechanisms, animal reproduction.
Course Learning Outcomes (CLOs)	Analyzing the bioprocesses that occur in animals in carrying out life processes in their environment
Teaching and Learning Strategies	Lectures, Practicum
Assessment and Evaluation	Assessment is carried out based on written examinations, assessment/evaluation of the learning process and performance with the following components: Structured tasks: 30%; Mid Test: 20%; Final Test: 20%; Practicum 30%
Weekly Course Schedule	1. Introduction and cell structure and function 4. Osmoregulation and Comparative Osmoregulation 5. Animal nutrition and digestion 6. Transport and circulation of blood 7. Respiration and gas exchange 8. Animal adaptation and body defense 9. Internal environment control 10. Chemical signals in animals 11. Nervous system 12. Sensory and motor mechanisms 13. Animal reproduction
Learning Media	Powerpoint Presentation, laptop/ pc, projector; V Class UNILA (G-meet atau zoom); E book.
References	Primary:

	1. Hill, RW&G.A Wyse and Anderson. 2008. <i>Animal Physiology</i>. NY: Harper & Row pb 2. Kartolo Wulangi. 1993. <i>Principles of Animal Physiology</i>. Jakarta: Directorate General of Higher Education 3. Moyes, CD and PM Schulte. 2006. <i>Principles of Animal Physiology</i> . San Francisco : Pearson Education Inc. 4. Soewolo.2000. <i>Introduction to Animal Physiology</i> . PPGSM Dikti 5. Meti Indrowati and Sumanto. 2007. Textbook of Animal Physiology. 6. Guyton, AC & Hall. 2010. Medical Physiology. ECG Medical Book Publisher, Jakarta 7. Campbell, NA, Rece, JB, Michel LG Biology, 5th edition, Volume 3. Publisher: Erlangga 8. Prosser, C.L. Environmental and Metabolic Animal Psycologi : Comparative animal Phyology, Wiley-Liss, Inc. Publication. New York- USA 9. Pearce, E. 2006. AnatomidanFisiologiuntukParamedis. PT. Gramedia. Jakarta 10. Schmidt-Nielsen, Knut. 1998. AnimalPsylogy : Adaptation and Environtment, 5th edition. Cambride University Press, USA. 612p 11. Jalmo, T., & Maulina, D.2023. Fisiologi Hewan. Pustaka Media, Bandar Lampung. 12. Derrickson, B. H. 2019. Human Physiology (Loose-leaf). John Wiley & Sons. Supporters: 1. OpenStax. 2022. <i>Anatomy and Physiology 2e</i>. OpenStax, Rice University. 2. Aspinall, V. & Cappello, M. 2024. <i>Introduction to Animal and Veterinary Anatomy and Physiology</i> (5th ed.). CABI. 3. Urry, L. A., Cain, M. L., Wasserman, S. A., Minorsky, P. V., & Orr, R. B. 2021. <i>Campbell Biology (12th ed.)</i>. Pearson. 4. Silverthorn, DU (2020). <i>Human Physiology: An Integrated Approach</i> (6th ed.). EGC Medical Book Publishers. 5. Maulina, D., Priadi, MA, Lengkana, D., Jalmo, T., Fauzisar, AS, & Amin, M. 2020. Book of insects' immune system: development and implementation with PBL in increasing students' learning outcome. <i>Biosfer: Jurnal Pendidikan Biologi</i> , 13(1), 42-58. https://doi.org/10.21009/biosferjpb.v13n1.42-58 6. Maulina, D., Sumitro, SB, Lestari, SR, & Djoa, DD 2025. <i>Spodoptera litura</i> F. immune system against exposure to the biopesticide Mirabilis jalapa L. <i>AGRIVITA Journal of Agricultural Science</i> , 47(1), 11-20. http://doi.org/10.17503/agrivita.v47i1.4351
Class Rules and Ethics	1. Study and examination requirements: 2. Students must attend 10 minutes before the class starts. 3. Students must switch off all electronic devices. 4. Students must open a camera and mute microphone during online class unless they must discuss or answer questions 5. Students must inform the lecturer if they will not attend the class due to



	6. sickness, etc. 7. Students must submit all class assignments before the deadline. 8. Students must attend the exam to get a final grade.
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Bandar Lampung, August 2025

Person in Charge of the Course (PJKM)

Dr. Tri Jalmo, M.Si



UNIVERSITY OF LAMPUNG
FACULTY OF TEACHER TRAINING AND EDUCATION
DEPARTMENT OF MATHEMATICS AND NATURAL SCIENCES
BIOLOGY EDUCATION STUDY PROGRAM

SEMESTER LEARNING PLAN (RPS)

Course Name	Currency Code Studying	Weight (credits)	Semester	Date of Compilation
Animal Physiology	KBO 616209	3 (2-1)	6	May 2, 202 5
Authorization	Developer Coordinator Name RPS	Course Coordinator (If Any)	Head of Study Program	
	 Dr. Tri Jalmo, M.Si Dr. Dina Maulina, M.Si Ismah Fathimah, M.Pd.	 Dr. Tri Jalmo, M.Si	 Rini Rita T. Marpaung, S.Pd., M.Pd.	

Learning Outcomes (CP)	CPL-PRODI (Study Program Graduate Learning Outcomes) Assigned to Courses
	Attitude 1. Be pious to God Almighty and be able to demonstrate a religious attitude. 2. Internalize scientific values, norms, and ethics and be able to develop them through Animal Physiology lectures. 3. Collaborate and demonstrate a responsible attitude in the field of Animal Physiology studies. 4. Internalize the spirit of independence and fighting spirit and be able to develop it through Animal Physiology lectures. General Skills 1. Applying logical, critical, systematic, and innovative thinking in the context of developing or implementing science and technology that pays attention to and applies humanities values that are appropriate to the field of Animal Physiology. 2. Demonstrate independent, quality, and measurable performance through learning Animal Physiology. CP Special Skills 1. Examine the implications of the development or implementation of science and technology that pay attention to and apply humanities values in accordance with the field of Animal Physiology based on scientific rules, procedures and ethics in order to produce solutions, ideas and designs. 2. Compile a scientific description of the results of Animal Physiology studies in the form of an investigation report. CP Knowledge 1. Mastering facts, concepts, principles, laws, theories, and procedures in the field of Animal Physiology in depth and their application. 2. Have sensitivity in finding problems regarding Animal Physiology. 3. Applying logical, critical, systematic and innovative thinking in the context of solving Animal Physiology problems.

	4. Communicate recommendations on problem solving in the context of Animal Physiology based on application and research	
	CPMK (Course Learning Outcomes)	
	Analyzing the bioprocesses that occur in animals in carrying out life processes in their environment	
Brief Description of Course	This course aims to provide knowledge about the basic concepts of physiology which include: introduction and structure and function of cells, osmoregulation and comparative osmoregulation, animal nutrition and digestion, blood transport and circulation, respiration and gas exchange, animal adaptation and body defense, control of the internal environment, chemical signals in animals, the nervous system, sensory and motor mechanisms, animal reproduction.	
Study Materials / Learning Materials	1. Introduction and structure and function of cells 2. Osmoregulation and comparative osmoregulation 3. Animal nutrition and digestion 4. Blood transport and circulation 5. Respiration and gas exchange 6. Animal adaptation and body defense 7. Internal environmental control 8. Chemical signals in animals 9. Nervous system 10. Sensory and motor mechanisms 11. Animal reproduction	
Reference List	Main:	1. Hill, RW&G.A Wyse and Anderson. 2008. Animal Physiology . NY: Harper & Row pb 2. Kartolo Wulangi. 1993. Principles of Animal Physiology . Jakarta: Directorate General of Higher Education 3. Moyes, CD and PM Schulte. 2006. Principles of Animal Physiology . San Francisco : Pearson Education Inc. 4. Soewolo.2000. Introduction to Animal Physiology . PPGSM Dikti 5. Meti Indrowati and Sumanto. 2007. Textbook of Animal Physiology. 6. Guyton, AC & Hall. 2010. Medical Physiology. ECG Medical Book Publisher, Jakarta 7. Campbell, N.A., Rece, J.B., Michel L.G. Biologi, 5th edition, Jilid 3. PenerbitErlangga 8. Prosser, C.L. Environmental and Metabolic Animal Psychology : Comparative animal Physiology, Wiley-Liss, Inc. Publication. New York- USA 9. Pearce, E. 2006. AnatomidanFisiologiuntukParamedis. PT. Gramedia. Jakarta 10. Schmidt-Nielsen, Knut. 1998. AnimalPhysiology : Adaptation and Environment, 5th edition. Cambridge University Press, USA. 612p 11. Jalmo, T., & Maulina, D.2023. Fisiologi Hewan. Pustaka Media, Bandar Lampung. 12. Derrickson, B. H. 2019. Human Physiology (Loose-leaf). John Wiley & Sons.
	Supporters:	1. OpenStax. 2022. <i>Anatomy and Physiology 2e</i>. OpenStax, Rice University. 2. Aspinall, V. & Cappello, M. 2024. <i>Introduction to Animal and Veterinary Anatomy and Physiology</i> (5th ed.). CABI. 3. Urry, L. A., Cain, M. L., Wasserman, S. A., Minorsky, P. V., & Orr, R. B. 2021. <i>Campbell Biology (12th ed.)</i>. Pearson. 4. Silverthorn, DU (2020). <i>Human Physiology: An Integrated Approach</i> (6th ed.). EGC Medical Book Publishers. 5. Maulina, D., Priadi, MA, Lengkana, D., Jalmo, T., Fauzisar, AS, & Amin, M. 2020. Book of insects' immune system: development and implementation with PBL in increasing students' learning outcome. <i>Biosfer: Jurnal Pendidikan Biologi</i> , 13(1), 42-58. https://doi.org/10.21009/biosferipb.v13n1.42-58

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- Name of the Lecturer**
1. Dr. Tri Jalmo, M.Si
 2. Ismah Fathimah, M.Pd.
 3. Dr. Dina Maulina, M.Si

Prerequisite courses (If any)

Animal Structure and Vertebrate Zoology

Week	Sub-CPM K (Planned final capability)	Study Materials (Learning Materials)	Learning Forms and Methods [Learning Media & Resources]		Estimated Time	Student Learning Experience	Evaluation		
							Criteria & Forms	Indicator	Weight (%)
1	2	3	4		5	6	7	8	9
I	Describe the scope of animal anatomy and physiology	Study Contract Scope of Animal Physiology	- Lectures, Discussions - Media: Video and materials. ppt	- online <i>e-learning</i> https://clas.sroom.gole.com/c/MTE0NTg2Nzg4M_Tc3 - Media: Video, ppt - Source: Learn: e-book	Face to Face (TM) 3 x 50'	Student presentations, class discussions and lecturer confirmation	- Test written mid-term exam - Structured assignment assessment	1. Mention the rules of Animal Physiology lectures 2. Explain the scope of animal physiology	5
II and III	Explain the osmoregulation mechanisms of various aquatic animals	Osmoregulation of aquatic animals (fresh, salty, brackish)	- Lectures, discussions - Media: Video and materials. ppt	- online <i>e-learning</i> https://clas.sroom.gole.com/c/MTE0NTg2Nzg4M_Tc3 - Media: Video, ppt. - Source Learn: e-book	Face to Face (TM) 3 x 50'	Student presentations, class discussions and lecturer confirmation	- Test written mid-term exam - Structured assignment assessment	1. Explaining the importance of osmoregulation in aquatic animals 2. Explain the body components that play a role in osmoregulation 3. Explain the mechanism of osmoregulation in freshwater animals 4. Explaining the mechanism of osmoregulation in saltwater and brackish	20

								water animals	
IV	Explain the osmoregulation mechanisms of various land animals and humans.	• Osmoregulation of land animals and humans	• Lectures, discussions • Media: Video and materials. ppt	• online e-learning https://classroom.google.com/c/MTg0NTg2Nzg4MTc3 • Media: Video, ppt. • Source Learn: e-book	Face to Face (TM) 3 x 50'	Student presentations, class discussions and lecturer confirmation	• Test written mid-term exam • Structured assignment assessment	1. Explain the importance of osmoregulation in land animals and humans. 2. Explain the body components that play a role in osmoregulation 3. Explain the mechanism of osmoregulation in land animals 4. Explain the mechanism of osmoregulation in humans	
V	Explain the mechanisms of animal and human thermoregulation	• Thermoregulation in animals and humans	• Lectures, Discussions • Media: Video and materials. ppt	• online e-learning https://classroom.google.com/c/MTg0NTg2Nzg4MTc3 • Media: Video, ppt Learning Resources: e-book	Face to Face (TM) 3 x 50'	Student presentations, class discussions and lecturer confirmation	• Test written mid-term exam • Structured assignment assessment	1. Explaining the importance of thermoregulation 2. Explain the body components that play a role in thermoregulation 3. Explain the relationship between thermoregulation and animal survival 4. Explain the relationship between thermoregulation and habitat 5. Explaining the differences in thermoregulation mechanisms between animals and humans	
VI	Explain the mechanisms of nutrition and digestion in animals and humans	Nutrition and digestion	• Lectures, Discussions • Media: Video and materials. ppt	• online e-learning https://classroom.google.com/c/MTg0NTg2Nzg4MTc3 • Media: Video, ppt • Source • Learn: e-book	Face to Face (TM) 3 x 50'	Student presentations, class discussions and lecturer confirmation	• Test written mid-term exam • Structured assignment assessment	1. Explaining the importance of nutrition in animals 2. Explain the components of the nutritional and digestive systems 3. Explaining the relationship between food types and the digestion process 4. Explaining the comparison of digestion between animals	

VII	Explain the mechanisms of transportation and blood circulation in animals	Transportation and circulatory system	• Lectures, Discussions • Media: Video and materials. ppt	• online e-learning https://classroom.google.com/c/MT E0NTg2Nz • g4MTc3 • Media: Video, ppt • Source • Learn: e-book	Face to Face (TM) 3 x 50'	Student presentations, class discussions and lecturer confirmation	• Test written mid-term exam • Structured assignment assessment	1. Explain the importance of transportation and blood circulation in animals 2. Explain the components of the transportation and circulatory system 3. Explain the mechanisms of blood transport and circulation 4. Explain the differences in transport and circulatory systems between animal species	
VIII	Midterm exam								
IX	Explain the mechanisms of respiration and gas exchange	Respiratory system and gas exchange	• Lectures, Discussions • Media: Video and materials. ppt	• online e-learning https://classroom.google.com/c/MT E0NTg2Nz • g4MTc3 • Media: Video, ppt • Source • Learn: e-book	Face to Face (TM) 3 x 50'	Student presentations, class discussions and lecturer confirmation	• Test • written FINAL EXAM • Evaluation structured tasks	1. Explain the importance of respiration and gas exchange 3. Explain the components of the respiratory and gas exchange systems 4. Explain the mechanisms of respiration and gas exchange 5. Explain the differences in the respiratory and gas exchange systems in various types of animals.	10
X	Explain the mechanisms of adaptation and defense of the animal body	Adaptation and body defense	• Lectures, Discussions • Media: Video and materials. ppt	• online e-learning https://classroom.google.com/c/MT E0NTg2Nz • g4MTc3 • Media: Video, ppt • Source • Learn: e-book	Face to Face (TM) 3 x 50'	Student presentations, class discussions and lecturer confirmation	• Test • written FINAL EXAM • Structured assignment assessment	1. Explaining the importance of adaptation and body defense 2. Explains the components that make up the parts that play a role in adaptation and body defense. 3. Explain the mechanisms of adaptation and defense of the bodies of various animals 4. Explain the differences in adaptation and body defense between animals	10

XI	Explain the mechanism of chemical coordination in animals	Chemical coordination system (hormonal system)	• Lectures, Discussions • Media: Video and materials. ppt	• online e-learning https://classroom.google.com/c/MT E0NTg2Nz g4MTc3 • Media: Video, ppt • Source • Learn: e-book	Face to Face (TM) 3 x 50'	Student presentations, class discussions and lecturer confirmation	• Test written FINAL EXAM • Structured assignment assessment	1. Explain the importance of the chemical coordination system (hormone action) for animals 2. Explain the components of the chemical coordination system 3. Explain the working mechanism of hormones in various types of animals	10
XII	Explaining sensory and motor mechanisms	Sensory and Motor Mechanisms (senses)	• Lectures, Discussions • Media: Video and materials. ppt	• online e-learning https://classroom.google.com/c/MT E0NTg2Nz g4MTc3 • Media: Video, ppt • Source Learn: e-book	Face to Face (TM) 3 x 50'	Student presentations, class discussions and lecturer confirmation	• Test written FINAL EXAM • Structured assignment assessment	1. Explain the importance of the sensory system for animals 2. Explaining the components of the senses 3. Explaining the working mechanism of the sensory system in various types of animals	10
XIII	Explain the coordination mechanism of the animal nervous system	Animal nervous coordination system	• Lectures, Discussions • Media: Video and materials. ppt	• online e-learning https://classroom.google.com/c/MT E0NTg2Nz g4MTc3 • Media: Video, ppt • Source • Learn: e-book	Face to Face (TM) 3 x 50'	Student presentations, class discussions and lecturer confirmation	• Test written FINAL EXAM • Structured assignment assessment	1. Explaining the importance of the nervous system in growth function 2. Explain the components of the nervous system 3. Explaining the working mechanism of the nervous system in various types of animals	

XIV	Explain the excretion mechanism in various animals	Excretory system	• Lectures, Discussions • Media: Video and materials. ppt	• online e-learning https://classroom.google.com/c/MT E0NTg2Nz • g4MTc3 • Media: Video, ppt • Source • Learn: e-book	Face to Face (TM) 2 x 50'	Student presentations, class discussions and lecturer confirmation	• Test written FINAL EXAM • Structured assignment assessment	1. Explaining the importance of the excretory system in growth function 2. Explain the components of the excretory system 3. Explaining the mechanism of excretion in various types of animals	
XV	Explain the reproductive mechanisms in various animals	Reproductive System	• Lectures, Discussions • Media: Video and materials. ppt	• online e-learning https://classroom.google.com/c/MT E0NTg2Nz • g4MTc3 • Media: Video, ppt • Source • Learn: e-book	Face to Face (TM) 2 x 50'	Student presentations, class discussions and lecturer confirmation	• Test written FINAL EXAM • Structured assignment assessment	1. Explaining the importance of reproduction for animals 2. Explain the components of the reproductive system 3. Explaining the working mechanism of the reproductive system in various types of animals	
XVI	Final Exams								100

Notes :

1. Study Program Graduate Learning Outcomes (CPL-PRODI) are the abilities possessed by each PRODI graduate which are the internalization of attitudes, mastery of knowledge and skills according to the study program level obtained through the learning process. The CPL charged to a course is a number of learning outcomes of study program graduates (CPL-PRODI) which are used to form/develop a course consisting of aspects of attitude, general skills, special skills and knowledge.
2. Course CP (CPMK) is a capability that is specifically described from the CPL that is assigned to the course, and is specific to the study material or learning material of the course.
3. Sub-CP Course (Sub-CPMK) is a capability that is specifically described from CPMK that can be measured or observed and is the final capability planned at each learning stage, and is specific to the learning material of the course.
4. Assessment Criteria are benchmarks used as a measure or yardstick for learning achievement in assessment based on established indicators. Assessment criteria are guidelines for assessors to ensure consistent and unbiased assessment. Criteria can be quantitative or qualitative.
5. The assessment indicators for students' learning process and outcomes are specific and measurable statements that identify students' learning outcomes or abilities, accompanied by evidence.



In determination mark end based on on percentage weighting as following:

Component Evaluation	Percentage Mark (%)
Structured tasks: 30%;	30
Mid Test: 20%;	20
Final Test: 20%;	20
Practicum 30%	30
Amount	100

Assessment Rubric



Evaluation participatory student

No	Aspect evaluation	Weight participatory
1	Participation in discussion,	25
2	Ability ask And answer	25
3	Cooperation in group	25
4	Responsible answer on task	25

Evaluation Presentation

No	Aspect evaluation	Weight participatory
1	Mastery material	25
2	Ability communication	25
3	Product presentation	25
4	Attitude presentation	25

Evaluation

No.	Indicator	Evaluation		
		Type	Form	Criteria
1.	Control draft theoretical	Test written	Rubric Test	Correct and complete answer = 4 Correct and incomplete answers = 3 correct and incomplete answers = 2 correct answers and very incomplete = 1 Answer wrong/not there is = 0
2	Skilled do investigation.	Character behavior observation practice	Observation Sheet	Honesty = 18%, discipline = 24%, responsibility = 12%, creative = 29%, And care = 18% with criteria according to the rubric Which attached.

Learning Outcomes (CP)	CPL-PRODI (Achievements Learning Graduate of Program Studies) Which Charged on Eye Studying
	Apply thinking logical, critical, systematic And innovative in context development/implementation knowledge knowledge and technology that pays attention to and applies communication of humanities values in accordance with their field of expertise. Control draft, principle, theory, law And process biology For finish problem in education biology based on cultural diversity
	CPMK (Achievements Learning Eye Studying)
	Analyze connection between structure network compiler organ on system organ in relation with bioprocess And disturbance function in animals
Form Assessment	Test written in form essay
Aspect Which measured	cognitive
Allocation Time	100 minute

No	Sub Discussion	Levels cognitive							Amount grains	Question number
		C1	C2	C3	C4	C5	C6			
1.	mechanism osmoregulation of various animals water				√				1	1
2	mechanism osmoregulation various animal land and humans				√				1	2
3	mechanism animal thermoregulation and man				√				1	3
4	nutritional mechanisms and digestion on animal and humans				√				1	4
5	mechanism transportation and blood circulation in animals				√				1	5
Amount									5	

INSTRUMENT ASSESSMENT

No	Objective Learning	Levels Cognitive	Question	Score
1	Analyze mechanism osmoregulation various animal water	C4	1	20
2	Analyze mechanism osmoregulation various animal land And man	C4	2	20
3	Analyze mechanism thermoregulation animal And man	C4	3	20
4	Analyze mechanism nutrition And digestion on animal And man	C4	4	20
5	Analyze mechanism transportation And circulation blood on animal	C4	5	20
	Amount		5	100

ASSESSMENT RUBRIC

No	Objective Learning	No. Question	Answer	Descriptor
1	Analyzing the mechanisms of osmoregulation various animals water	1 How does the osmoregulation mechanism work? various animal water	1. H ewan Water Bid (Freshwater Animals) Examples: Freshwater fish, amphibians (frogs) Problem main:** Environment **hypotonic** → water enter to body, salt out. Mechanism osmoregulation:** Water absorbed osmosis through gill And skin. on salt go out diffusion so that must compensated. Losing excess water through very dilute urine. Take ion salt active past gill use transport active. Example: Fish water bid own gill special Which active absorb Na^+ And Cl^- from water. - 2. **Animal Water Sea (Saltwater Animals) Examples: Sea fish, jellyfish, sharks Problem main:** Environment **hypertonic** → body lost water, salt in. Mechanism osmoregulation: Drink water sea** For replace lost Fluids. Remove excess salt through: Gill (fish teleost):** cell special active excrete Na^+ And Cl^-.	20 = write 2 answers each element correctly 10 = write answer minimum 1 answer each correct 0 = No There is answer with Correct

			Kidneys: produce very concentrated and little urine**. Body withhold water reduce lost through urine. Example: Fish sea (example fish tuna) emit ion salt through gill, not through urine. Animal Sea Invertebrates (for example jellyfish, star (sea) Usually **osmotolerant** (not regulating), meaning: The body's water and salt levels **adjust to the environment** (isosmotic). No active arrange osmoregulation, **energy Which used less**. Shark And Elasmobranchii (fish bony vulnerable) Unique strategy: No drink sea water Keep **urea And TMAO** in blood → pressure osmotic in body **more tall** from water sea. Water enter in a way osmosis → No water loss . The salt that enters **is excreted through the salt glands in the rectum (rectal gland) Amphibians Water (Frog, Salamander) Skin very permeable to water. Absorb water through skin (osmosis). Emit water excessive past urine **thin Take salt from water past skin and food.	
2	Analyzing the mechanisms of osmoregulation various animals land and humans	How does the osmoregulation mechanism work? various land animals and humans?	Osmoregulation is a physiological process used by organisms to maintain the balance of water and salts (ions) in their bodies, essential for maintaining homeostasis. This mechanism differs in land animals and humans due to differences in habitat and adaptation needs. 1. Osmoregulation on Animal Land Terrestrial animals (e.g. reptiles, birds, non-human mammals) live in the environment Which tends to be dry, so that they risky experiencing high water loss. Here is their osmoregulation mechanism: a. Water conservation Waterproof skin or exoskeleton: Insects have waxy exoskeletons, and reptiles have scaly skin to prevent water evaporation.	20 = write 2 answers each element correctly 10 = write answer minimum 1 answer each correct 0 = No There is answer with Correct

			Excretion of concentrated urine: Kidneys of land animals, especially mammals and birds, produce urine Which very concentrated For conserve water. For example, desert animals like kangaroo rats never drink water and rely solely on food metabolism. Semi-solid feces: Reptiles and birds excrete nitrogenous waste as uric acid (insoluble in water) in solid/semi-solid form. b. Retrieval water Drinking directly from water: Animals such as land mammals drink water actively. Metabolic water: Some animals rely on water produced from the oxidation of food (metabolic water). c. Organ excretion special Seabirds and reptiles have salt glands to excrete excess salt without losing too much water. Osmoregulation on Man Humans are also land animals, but with a more complex and conscious regulatory system. Kidney as organ main osmoregulation Filtration blood in nephron produce urine, get rid of excess water and dissolved substances such as salt, urea, etc. Reabsorption And secretion active: Happen in tubules kidney to reabsorb water and ions according to the body's needs. Role hormone ADH (Antidiuretic Hormone): Regulates the permeability of the renal tubule walls. When the body lacks water, ADH increases → more water is reabsorbed → more concentrated urine. Aldosterone: Arrange reabsorption sodium And potassium excretion → play a role No direct in retention water. Response to condition Moment dehydration: ADH increase → water saved → urine A little And concentrated. Moment excess fluid: ADH decrease → urine Lots And runny.	
3	thermoregulation mechanisms animals and man	How thermoregulatory mechanisms animal and humans?	Thermoregulation on Man (Homo sapiens) Humans are homoiothermic (endothermic) or warm-blooded, namely living creatures that are able to maintain a constant body temperature of around 36.5–37.5°C, even though the environmental temperature changes. Mechanism thermoregulation man: ➤ Moment temperature body rise (hot): Vasodilation: Blood vessels dilate → increases blood flow to the skin → heat is released to the environment.	20 = write 2 answers each element correctly 10 = write answer minimum 1 answer each correct 0 = No There is answer with Correct

			Sweating: Sweat issued through gland sweat → evaporation water absorb hot from skin. Behavior adaptive: Let go clothes, shelter, drink water. ➤ Moment temperature body down (cold): Vasoconstriction: Vessels blood narrow → reduces blood flow to the skin → body heat does not escape. Shivering (shivering): Muscle contract fast → produce hot through metabolism. Piloerection: Hair in skin stand → form layer air For hinder lost hot. Behavior adaptive: Use clothes warm, look for warm place . Thermoregulation on Animal Animal Endothermic (bloody hot) Thermoregulation internal through metabolism, as in mammals and birds. Example: Bird: Guard temperature body with hair, shelter, or puff up feathers to retain heat. Desert mammals (such as camels): Conserve heat during the day, sweat little, and are active at night (nocturnal). Bear poles: Layer fat thick And hair For isolation hot. B. Animal Ectotherm (bloody cold) Body temperature depends on the external environment. Examples: fish, amphibians, reptiles, and insects. Mechanism: Sunbathe in lower sun For raise temperature body (e.g. lizards). Hiding in place shady or enter to water to cool the body. Dormancy or hibernation moment temperature environment extreme (e.g. frogs, turtles).	
4	Analyzing nutritional mechanisms and digestion on animal and humans	How mechanism nutrition and digestion on animals and humans?	Mechanism Nutrition And Digestion on Man Man including animal omnivore And own system complex extracellular digestion with a complete digestive tract. Process Digestion (Digestion): a. Ingestion → b. Digestion Mechanic And Chemical → c. Absorption → d. Elimination Organ And The process: Process Organs Digestive Mouth mechanic (chew) & chemical (enzyme amylase)	20 = write 2 answers each element correctly 10 = write answer minimum 1 answer each correct 0 = No There is answer with Correct

			Esophagus Pushes food to the stomach (peristaltic movement) Stomach Enzyme pepsin + gastric acid → digests protein Small intestine Enzyme pancreas & bile → digest carbohydrates, fats, proteins → absorption nutrition through villi intestines Intestines large absorption water And formation feces Rectum–Anus Elimination remainder food Which No digested (defecation) The main nutrients that humans need: Carbohydrates → Protein energy source → builder network Fat → energy reserve & vitamin solvent And mineral → help reaction Water → solvent and chemical reaction medium Mechanism Nutrition And Digestion on Animal Depending on the animal species, digestive systems can range from simple to very complex. Animals are classified based on how and what they eat. Animal Invertebrates (without bone behind) Animal simple (eg. Amoeba, Hydra): Digestion intracellular → food digested direct in in cell (through phagocytosis And enzyme lysosomes) Example: Amoeba swallows food with pseudopodia → forms food vacuoles → enzymes digest. Worm land: Channel digestion complete (mouth–anus) Food enter → mouth → pharynx → cache → gizzard (breaks down food) → intestines → exits through the anus. B. Animal Vertebrates (bony behind) Herbivores (eater plant): Have intestines Which long & organ special like cecum big or compound stomach (e.g. cow). Cow: Stomach has 4 parts (rumen, reticulum, omasum, abomasum) → symbiosis with microbes → digests cellulose. Carnivores (eater meat): The intestines are shorter, because meat is easily digested. Enzymes digestive protein dominant (pepsin, trypsin). Omnivore (eater all, including man, pig, bear):	
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			Channel digestion flexible → digest carbohydrate, protein, And fat.	
5	Analyzing the mechanism transportation and blood circulation in animals	How transportation mechanism And circulation blood in animals?	. Animal Invertebrates (No Boned Behind) Animal without system circulation (very simple) Examples: Porifera (sponges), Cnidaria (jellyfish), Platyhelminthes (flatworms) No Have system circulation blood. Transport substance happen through diffusion direct between cell to the surrounding environment because its body is thin And surface wide. Animal with system circulation open Example: Arthropods (insect, shrimp), part Molluscs Blood (hemolymph) No always is at in vessels → direct wet organ body in in cavity. Heart pump hemolymph to in cavity body → return to heart through hole special (ostium). Efficiency low → suitable For animal with metabolism low or size small. Animal with system circulation closed Example: Annelida (worm land), squid (mollusk level tall) Blood always flow in vessels blood (arteries–veins –capillaries). Heart pump blood in a way efficient → distribution substance more fast. Efficiency height → support metabolism active And body more big. Animal Vertebrates (Boned Behind) All vertebrates have a closed circulatory system and the heart as the central organ of blood circulation, but their structure and mechanisms are different. Fish Heart 2 room: 1 atrium, 1 ventricles Circulation blood single Track: heart → gill → all over body → return to heart Blood only pass heart very every One cycle. Blood Which pumped from heart not enough oxygenated Because only take O₂ in gill. Amphibians (frog) Heart 3 room: 2 atrium, 1 ventricles Circulation blood double No perfect Track: heart → lungs/gills → heart → all over	20 = write answer minimum 4 points for each element correctly 10 = write 2 answers each element correctly 0 = No There is answer with Correct



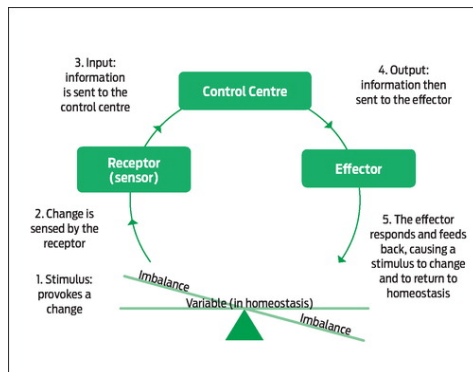
			body → return to heart Oxygenation happen in lungs And skin. Oxygen And carbon dioxide mixed in ventricle. C. Reptile (snake, lizard, crocodile) Heart 3 room (2 atrium, 1 ventricle) → with septum partial Crocodile: 4 room like bird And mammals. Circulation blood double almost perfect Mixture blood Already start at least Because the presence of partial partitions. More efficient compared to amphibians. D. Bird And Mammals Heart 4 room: 2 atrium, 2 ventricles Circulation blood double perfect No There is mixing blood rich O₂ And poor O₂. Track: Circulation pulmonary (lungs): heart → lungs → heart Circulation systemic (body): heart → body → heart Very efficient For support metabolism tall and intensive activities.	
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Question sheet for Mid Term Course Examination

MID-SEMESTER EXAM (UTS) FOR ANIMAL PHYSIOLOGY COURSE

Instructions: Read the questions carefully and answer briefly – exactly as the question asks.

1. Homeostasis is a vital internal mechanism in animals for survival in an ever-changing environment. Homeostasis involves at least three components, with steps as shown in the following diagram (score 20).

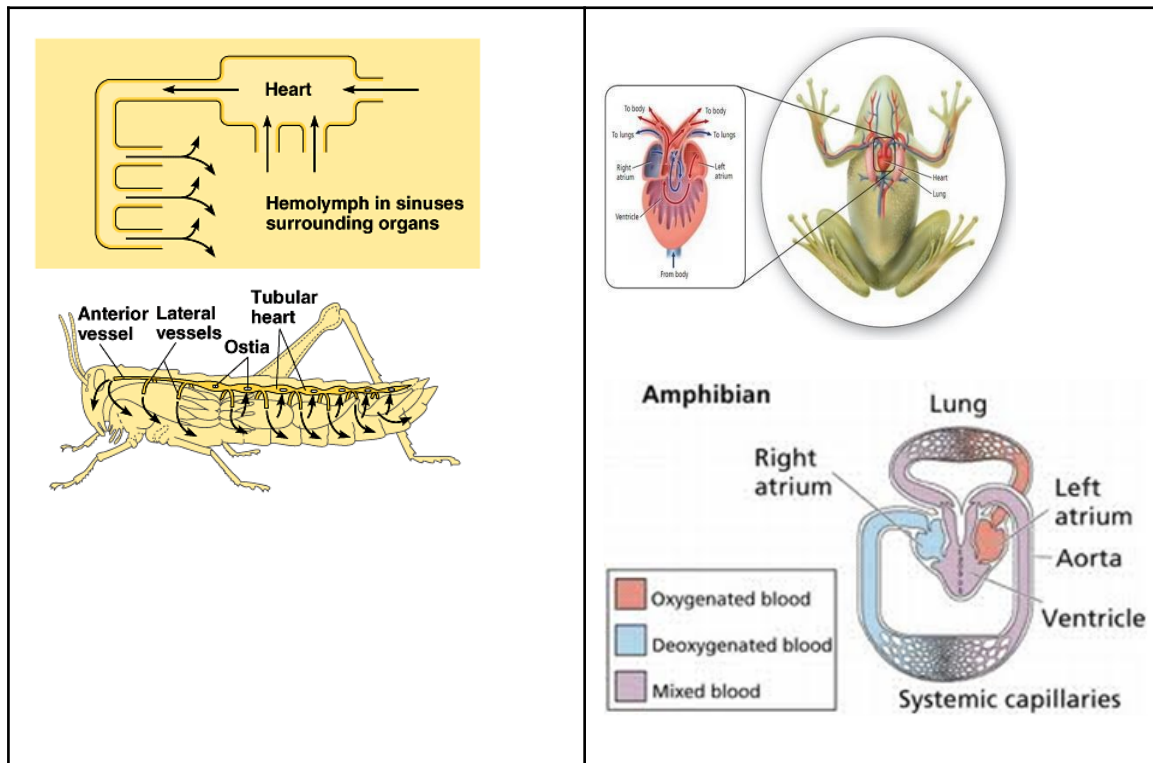


Question:

- Describe the chart
 - Take one example of homeostatic regulation in an animal's body and explain the homeostatic process using a diagram and involving its components.
2. Osmoregulation is a mechanism for regulating osmotic pressure in animals, but the mechanism differs depending on the habitat of the animal (score 15).
- How does the osmoregulation mechanism work in *euryhaline* and *stenohaline* animals?
 - How much energy is used during osmoregulation in *euryhaline* and *stenohaline* animals? Why is this so?
3. Mr. Badu kept goldfish in his backyard pond, then his son Rayyan made a homemade saltwater aquarium which he placed in the living room. The aquarium contained coral reefs and other colorful saltwater fish. One afternoon, while Ani, Mr. Banu's youngest child, was playing, he took a baby goldfish from the backyard pond and put it in the aquarium. Because he didn't know, the goldfish died 45 minutes after being put in the aquarium. Why is that? (score 10)
4. Terrestrial animals have different osmoregulation than aquatic animals due to the extreme/high temperatures of the terrestrial environment. (score 10)
- How does osmoregulation occur in terrestrial animals?
 - How is thermoregulation in terrestrial animals?
5. Food digestion (score 15)
- Is the purpose of digestion the same or different in animals? Why is that?
 - What are the differences between the digestive systems of animals? Explain each difference.
 - Are the stages of digestion the same or different for each animal? Provide an explanation.
6. Respiration (score 15)
- Is the purpose of respiration the same for every animal? Explain.
 - How effective are the cocurrent, countercurrent, and crosscurrent gas exchange models? Why is this so?

c. How is the type of gas exchange related to an animal's habitat? Provide a detailed explanation.

7. Look at the picture below (score 15)



- Is the purpose of respiration in the two animals above the same? Provide an explanation.
- How is the circulatory system of the two animals above?
- Explain the mechanism of each circulatory system in the two animals above.

Question sheet for Final Course Examination

FINAL SEMESTER EXAM FOR ANIMAL PHYSIOLOGY COURSE

Instructions for working on the questions:

- Read the questions carefully and answer the questions according to the questions asked.
- Answers may not be in sequence with the question number.
- It is not permitted to cheat and seek answers from references in any form.
- Answers typed within 90 minutes

Question:

1. Nasir and Nina were observing an artificial pond near their house, where they found tilapia and frogs living. Fitra said that, given the same body size and food intake, frogs are aquatic animals that breathe more powerfully to produce more energy than tilapia. Nasir stated that frogs have a much more complete set of lung respiratory organs than tilapia. In response, Nina nodded in agreement with Nasir. Do you agree with Nasir's statement? Provide your reasons. (Score 20)
2. Laila is a medical student who is doing a practical on checking a patient's blood pressure with the following results:



Based on the blood pressure readings, what do you think the patient's condition is? Explain how blood pressure in the patient's body is regulated based on the readings on the blood pressure meter. (Score 20)

3. Wenda is a 20-year-old student at a state university in Indonesia. As an adult woman, Wenda is concerned about her body's condition, as she has not yet menstruated. She feels she is getting enough daily nutrition and has been developing other secondary characteristics since she was 12. As a biology education student who has taught the Fiswan course, can you explain why Wenda has not yet menstruated, and how this regulatory imbalance in her body could have occurred? (Score 20)
4. Lani and Hasya, 6 years old and neighbors, were playing together in their yard that afternoon. From a distance, someone was seen carrying a large, white-haired, and very eye-catching Siberian Husky dog tied to a leash around the dog's neck. Lani was very enthusiastic and immediately rushed to the dog, wanting to hug the dog and joke around. In contrast, Hasya was shocked when the Siberian Husky barked loudly, making Hasya startled and ran as fast as she

could into her house while crying and hugging her mother. This incident shows a different response when someone receives a stimulus. Tell us about the involvement of Lani and Hasya's body coordination system to obtain different responses between the two? (Score 20)

5. Ihsan walked in the backyard of his house which was planted with many fruits. Ihsan secretly noticed a grasshopper on the branch of his guava tree, because he was curious about its behavior pattern, Ihsan wanted to catch the grasshopper. However, when Ihsan's hand had not reached the branch, the grasshopper jumped to another branch as fast as lightning so that Ihsan could not catch it. Ihsan was confused by the grasshopper's jumping event even though Ihsan did not make a loud noise, and the movement to catch it was done very calmly and slowly. Can you explain to Ihsan how the event happened? Link the series of reactions to the sensory and motor mechanisms of animals that occurred in the event! (point 20)

-----Happy Working With Honesty-----

Assessment Rubric of Final Examination

No.	Answer Key	Scoring Rubric
1	Agreement with reasoning: No, frogs do not necessarily breathe more powerfully than tilapia solely due to lung completeness; oxygen demand is related to metabolism, environment, and respiratory adaptation. Reason: Frogs have lungs and also use skin respiration, while tilapia use gills adapted to extract oxygen from water efficiently. Oxygen uptake depends on the medium and physiological needs.	Score 16–20: Accurate explanation of respiratory adaptations in frogs and tilapia, linking anatomy (lungs vs gills) and physiology (oxygen exchange, environment). Score 11–15: Explains main differences in respiratory organs but lacks detail on physiological reasoning. Score 6–10: Mentions difference in organs but provides vague or incomplete reasoning. Score 0–5: Incorrect or irrelevant explanation.
2	Condition: Possible hypertension or hypotension depending on reading given (assume hypertension if systolic ≥ 140 mmHg or diastolic ≥ 90 mmHg). Regulation: Blood pressure is regulated by cardiac output, blood volume, peripheral resistance, and neural/hormonal mechanisms (baroreceptor reflex, renin-angiotensin system, vasodilation/vasoconstriction).	Score 16–20: Correctly identifies condition and explains regulation mechanisms in detail, including at least two control systems. Score 11–15: Correct condition with one regulation mechanism explained. Score 6–10: Partial or vague explanation of condition and regulation. Score 0–5: Incorrect diagnosis and no clear mechanism.
3	Cause: Primary amenorrhea due to possible hormonal imbalance in hypothalamic-pituitary-ovarian (HPO) axis. Mechanism: Possible disruptions in GnRH secretion, LH/FSH release, or estrogen production affecting endometrial development. Could be due to genetic, anatomical, or endocrine factors.	Score 16–20: Accurately identifies primary amenorrhea and explains hormonal regulation and possible causes in detail. Score 11–15: Identifies amenorrhea and mentions one hormonal cause but lacks depth. Score 6–10: General explanation with minimal connection to hormonal regulation. Score 0–5: Incorrect or irrelevant cause.
4	Explanation: Different responses are due to differences in nervous system processing and emotional perception. Lani's response involves parasympathetic dominance (approach behavior) while Hasya's involves sympathetic activation (fight-or-flight response). Sensory input via auditory and visual pathways leads to different hypothalamic responses.	Score 16–20: Detailed explanation of sensory processing, CNS involvement, and autonomic nervous system role in emotional responses. Score 11–15: Explains nervous system involvement but with limited detail on pathways. Score 6–10: General mention of "nervous system" without specific mechanisms. Score 0–5: Incorrect or irrelevant explanation.
5	Explanation: Grasshopper detects approach through mechanoreceptors and compound eyes, initiating rapid escape reflex. Sensory neurons transmit to CNS, interneurons process, motor neurons stimulate jump muscles. Reflex is mediated through peripheral ganglia, enabling rapid response without full brain processing.	Score 16–20: Complete sensory-to-motor pathway explanation, mentioning receptors, neurons, and reflex arc. Score 11–15: Describes sensory input and motor output but lacks detail on processing. Score 6–10: General explanation without specific sensory or motor mechanisms. Score 0–5: Incorrect or irrelevant explanation.

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Course: Animal Physiology

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1. I don't really agree with Nasir. Frogs do have lungs, but that alone does not make their breathing stronger than tilapia. Frog also rely on cutaneous respiration to exchange oxygen, especially in water. Tilapia, on the other hand, use gills that are highly efficient in extracting oxygen from water, sometimes even more effective than lungs in aquatic environments. Oxygen demand is determined not only by the presence of lungs but also by metabolism and habitat. Since frogs have a lower metabolic rate than active fish like tilapia, tilapia often require more oxygen. Therefore, it is not accurate to say frogs breathe stronger simply because they possess lungs.

2. the blood pressure of 155/90 is above the normal range, which is usually around 120/80. This indicates hypertension, meaning the heart must pump blood with greater force and the arterial walls are under increased pressure. Contributing factors may include lifestyle choices such as consuming salty foods or experiencing stress, as well as genetics. If this condition persists, it may lead to cardiovascular or kidney problems. Physiologically, the body attempts to regulate blood pressure through the nervous system and hormones, but sometimes this balance cannot be restored, causing the pressure to remain high.

3. Wenda, who is 20 years old and has not yet menstruated, is experiencing a condition known as primary amenorrhea. Although she has developed secondary sexual characteristics, there may be a disruption in her reproductive hormonal system. The issue may lie in the hypothalamus failing to release GnRH, the pituitary not producing enough LH and FSH, or the ovaries not synthesizing estrogen adequately. Without proper estrogen and progesterone cycles, the endometrium cannot build up, resulting in the absence of menstruation. Genetic or anatomical abnormalities may also play a role, but in many cases the hypothalamic-pituitary-ovarian (HPO) axis is involved. Hence, medical evaluation is necessary to determine the underlying cause.

4. Although Iani and Hasya saw the same dog, their nervous systems produced different responses. Iani felt happy, so her parasympathetic system was more dominant, allowing her to approach the dog without fear. In contrast, Hasya felt scared when the dog barked, which triggered the activation of her sympathetic nervous system. This increased her heart rate, stimulated the release of

adrenaline, and caused her to run away. This condition is known as the Fight or Flight response.

5. Grasshopper can detect approach not only with sound but also with vision and vibration. They have compound eyes and mechanoreceptor on body. Even if the insect moves slowly, the insect can feel little vibration or shadow change. The receptor sends signal to sensory neuron, then to interneuron in ganglia. The process is very fast, not always goes to brain, so it is reflex. The motor neuron then activates strong muscles in hind legs, making the jump quick like lightning. That's ~~why~~ why humans cannot catch it. The grasshopper's nervous system is designed for survival with very fast reflex action.