“Structure and function of organisms”

PROJECT WORK Guidelines – Oral Presentation
Module of “General Physiology” – BSc Biotechnology (Year 1)

The presentation of the PROJECT WORK is optional for students.

Students who wish to undertake the PROJECT WORK may refer to the guidelines below for its structure.

The PROJECT WORK will be evaluated by the instructor and will contribute additional points to the final exam grade, as detailed in Part B of the document.

IMPORTANT DATES

-Participation in the PROJECT WORK must be confirmed via email to prof. Peserico **up to May 10** *(Please indicate in the email text: Surname, Name and Matr. Number of partecipants; Title of the Topic and related Application)*

-Oral Presentations of the Project Work will take place on **May 27, from 2:00 PM to 6:00 PM**

General organization

- Students will work in groups up to **5 members**
- Each group must **select one topic from the list provided**
- **The same topic cannot be chosen by more than one group**
- Topic selection will be confirmed to avoid duplication
- Each presentation will last **maximum 8-10 minutes**, followed by questions

Objective of the assignment

The aim of this activity is to show that you are able to:

- understand both **structure and function of the topic**
- **include an example of a biotechnological application**.**
- explain scientific concepts clearly
- use appropriate scientific terminology
- organize information in a logical way
- work effectively as a team

***Short example for students:**

Topic: *In vitro model of cardiac contraction*
Biotech application: *Drug testing on heart cells*

Example to be expanded and discussed:
Students culture cardiomyocytes and observe their beating under a microscope. Then, they apply a drug (e.g., a beta-blocker) and measure changes in contraction rate. This models how new cardiovascular drugs are tested before clinical trials.

How to approach your topic

Your presentation must integrate:

- **Structure** (how it is organized)
- **Function** (how it works)
- **Relationships** (how components interact)

Group work expectations

- All members must contribute to the preparation
- All members must speak equally during the presentation
- The work must be balanced across the group
- The presentation must be prepared collaboratively

Slides

- Maximum **8–12 slides**
- Avoid long paragraphs text
- Use structured content and visual material

What to avoid

- Copying lecture slides
- Listing information without explanation
- Treating structure and function separately without linking them
- Overloading slides with text

Presentation structure guide (optional)

1. Introduction
- *Define the topic*
- *Place it within the body (also with comparative aspects in different species)*
- *Explain its relevance*

2. Structural organization
- *Describe the main components*
- *Explain how they are arranged*
- *Highlight spatial relationships*

3. Functional explanation
- *Explain how the system works*
- *Describe key mechanisms and processes*

4. Integration (key part)
- *Show how structure and function are connected*
- *Explain why the system is organized in that way*

5. Visual support
- *Show a potential biotechnological application*

6. Conclusion
- *Summarize the key concepts*

TOPICS
(Choose 1 topic and 1 related application/group)

Cardiovascular System
1. Organization of the heart and coordination of the cardiac cycle
2. Cardiac muscle structure and mechanisms of contraction
3. Heart valves: structure and control of blood flow
4. Arterial structure and regulation of blood pressure
5. Capillary organization and fluid exchange mechanisms

Applications:
-Calcium-channel blocker drugs (blood pressure, arrhythmias)
-In vitro cardiac cell models for drug testing
-Calcium imaging in cells (fluorescence)
-Stem cells to study heart diseases

Respiratory System
6. Lung structure and gas exchange at the alveolar level
7. Airway organization and airflow regulation
8. Mechanics of breathing and thoracic structure
9. Respiratory epithelium and protective functions

Applications:
-Oxygen therapy
-Lung organoids for research
-CO_2 sensors monitors

Nervous System
10. Neuron structure and generation of electrical signals
11. Synapse organization and signal transmission
12. Spinal cord structure and reflex activity
13. Autonomic nervous system: organization and control

Applications:
- neurological drugs
-Study of neurodegenerative diseases
-Synapse models

Digestive System
14. Gastrointestinal wall organization and digestive processes
15. Stomach structure and regulation of gastric activity
16. Intestinal structure and nutrient absorption
17. Liver structure and metabolic organization
18. Pancreas: structural organization and digestive/endocrine roles

Applications:
-Intestinal absorption tests
-Drug delivery
-Microbiota–metabolism studies

Urinary System
19. Kidney structure and filtration process
20. Nephron organization and urine formation
21. Regulation of water balance and kidney structure
22. Urinary tract organization and urine transport

Applications:
-Diuretic drugs action
-Artificial kidney models

Endocrine System

22. Hormone signaling and target organ organization
23. Hypothalamus–pituitary axis: structure and regulation
24. Thyroid gland: structure and metabolic control
25. Pancreatic islets and glucose regulation

A**pplications:**
-In vitro tests to study hormone–receptor binding
-Biosensors to detect hormones in blood (diagnostic tests)
-Diagnostic tests to detect hormonal imbalances
-Cell models to study hormonal regulation
-Synthetic thyroid hormones (replacement therapy)
-Newborn screening for thyroid disorders
-Glucose sensors (glucometers)
-In vitro studies of diabetes using pancreatic cells

Reproductive System
26. Testis structure and spermatogenesis organization
27. Ovary structure and follicular development
28. Hormonal regulation of the reproductive system
29. Male reproductive tract and sperm maturation

A**pplications:**
-In vitro models to study sperm production
-Fertility testing (sperm count, motility analysis)
-Cryopreservation of sperm (fertility preservation)
-In vitro fertilization (IVF) techniques
-Oocyte cryopreservation (egg freezing)
-Study of ovarian disorders (e.g., PCOS)
-Hormone level tests (diagnostics)

PART B

EVALUATION GRADE

The project work presentation will be evaluated based on:

- Accuracy of content
- Clarity and organization
- Depth of understanding
- Quality of visual material
- Equal participation
- Communication skills

Evaluation Grade:

- Excellent (9 points)
- Very good (8 points)
- Good (5 points)
- Satisfactory (3 points)
- Minimum pass (1 point)