



Output of the Workshop on the Harmonization of Syllabi of Microbiology Courses in the Philippines

30 August 2018, Chancellor's Hall, University of the Philippines Los Baños

HARMONIZED SYLLABUS/OUTLINE FOR MICROBIAL PHYSIOLOGY

Course Outline:

- I. Introduction
 - A. Definition and scope of microbial physiology
 - i. Definition of microbial physiology
 - ii. Scope and limitations of the course
 - B. Phylogenetic tree of life
 - i. Bacteria
 - ii. Archaea
 - iii. Eukarya
- II. The bacterial cell: structures and functions
 - A. Major cellular structure
 - i. Structure of a prokaryotic cell
 - ii. Functions of the parts of a prokaryotic cell
 - B. Chemistry and synthesis of cellular structures
 - i. Biochemical composition of cellular structures
 - ii. Biosynthesis of cellular structures
 - iii. Prokaryotic development structures: myxospores of *Myxobacteria*, swarm cells of *Proteus*, endospores of *Bacillus*, heterocysts of *Anabaena*
- III. Microbial Growth
 - A. Definition of growth
 - i. Modes of Reproduction
 - B. Measurements of growth
 - i. By Cell Mass: Dry/Wet Weight, Turbidity, Biomolecule Concentrations
 - ii. By Cell Number: Standard Plate Count
 - iii. By Cell Activity: Substrate Utilization, Measurement of End/By-products
 - C. Growth Physiology
 - i. Phases of growth
 - a. Batch culture
 - b. Continuous culture
 - ii. Mathematics of growth
 - iii. Factors affecting the phases of growth

- D. Factors affecting growth and stress responses
 - i. Temperature
 - ii. pH
 - iii. Solutes
 - iv. Oxygen
 - v. Pressure
 - vi. Radiation
- IV. Microbial Nutrition and Solute Transport
 - A. Nutritional requirements of microorganisms
 - B. Mechanisms of transport
- V. Bioenergetics in the Cytosol
 - A. High energy molecules
 - B. Mechanisms of ATP synthesis
- VI. Prokaryotic Metabolism
 - A. Central metabolic pathways and their Regulation
 - i. Glycolysis
 - ii. Pentose Phosphate Pathway
 - iii. Entner-Doudoroff Pathway
 - iv. Tricarboxylic Acid Cycle
 - v. Glyoxylate cycle
 - B. Fermentation
 - i. Fermentation pathways
 - ii. Energy production
 - C. Photosynthesis
 - i. Photosynthetic pigments
 - ii. Photosynthetic pathways
 - iii. Energetics
 - D. Metabolism of lipids, nucleotides, amino acids and hydrocarbons
 - E. Inorganic metabolism
 - i. Oxidative pathways
 - ii. Dissimilatory pathways
 - iii. Assimilatory pathways
 - F. C1 metabolism
 - i. CO₂ metabolism
 - ii. Methanol metabolism
 - iii. Metabolism of other C1 compounds

REFERENCES (PARTIAL LIST)

BERG, J, TYMOCZKO, J, GATTO, G and STRYER, L. 2019. Biochemistry. 9th ed.
New York : W.H. Freeman and Company. 1296 p.

MADIGAN, MT, BENDER, KS, BUCKLEY, DH, SATTLEY, WM and STAHL, DA. 2021.
Brock Biology of Microorganisms. 16th ed. USA: Pearson Education Limited. 1120 p.

MOAT, AG, FOSTER, JW and SPECTOR, MP. 2002. Microbial Physiology. 4th ed. New Jersey, USA : Wiley-Liss, Inc. 734 p.

ROSENBERG, E, DELONG, EF, STACKERBRANDT, E, LORY, S and Thompson, F. 2013. The Prokaryotes: Prokaryotic Physiology and Biochemistry. 4th ed. Springer-Verlag Berlin Heidelberg. 662 p.

WHITE, D, DRUMMOND, J and FUQUA, C. 2012. The Physiology and Biochemistry of Prokaryotes. 4th ed. New York : Oxford University Press. 656 p.