Salahaddin University

College of Agriculture Engineering Science

Department of Fish Resources and

Aquatic Animal Department

Erbil

COURSE BOOK

General Microbiology (Practical)

Second year student

First semester-academic year 2023-2024

Course Book

Course title	General Microbiology(practical)	
Lecturer in charge	Dr. khalid Esmehel Aziz	
Dept/ College	Agriculture Engineering Sciences	Animal Resource
Contact details	Tel:	Email:
Course link in the University		
Coordinator's name	khalid Esmehel Aziz and Berivan Kayfi (Practically Lecture)	
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Course Content:

Identify the instruments and tools used in microbiology laboratory, microscope parts and it's function ,types of sterilization and importance of sterilization, composition and classification of culture ,staining and preparation of smear ,simple staining , gram staining , Fungi, chemical structure & texture of media , isolation of Fungi, identification of Fungi by Macroscopic examination.

Methods for isolating bacteria, antimicrobial susceptibility test , study characteristics of *Streptococci sp. ,Staphylococci sp.* and *Escherichia coli.*

Course Description:

Microbiology is the study of microorganisms, which are unicellular or cell-cluster microscopic organisms. This includes eukaryotes such as fungi and protists and prokaryotes such as bacteria and certain algae.

-Microbiologists study these organisms using tools, like microscopes, genetics, and culturing. Microscopes allow scientists to magnify microbial cells that are otherwise too small to see.

-These tiny microorganisms are present on our skin , clothes…..While some microorganisms are disease-cousing pathogens.

This course focused on the definition of microscope and the main parts of light microscope, preparing culture medium composition and classification of culture medium , methods of

staining, Staining is a technique used to enhance contrast in samples, generally at the microscopic level. Stains and dyes are frequently used in histology (the study of tissue under the microscope), types of staining and the main steps of staining laboratory sessions are focused on pure culture techniques and methods of counting microorganisms .

Fungi , method of isolate fungi ,culture media, Identification of Fungi by Macroscopic examination .

The students shall demonstrate knowledge of common microbiological terms, facts principles though exams also understanding of the scientific approach by it's application in class.

Course Objectives:

By taking this course and at the end of this course ,students will be able to:

1-Know parts of the light microscope and the function of each part.

2-Understanding principles and methods of sterilization relative to general microbiology.

3-Preparing a bacterial smear from a culture grown in solid and a culture grown in broth.

4- Know the differences between simple staining and differential staining.

5-The students be able to prepare culture medium and culturing microorganisms, know the terms that used to describe characteristics of culture and using streaking technique.

6- Know about the fungi

7. The students know what is different between fungi &bacterial used method of isolate , culture media, duration time of growth, morphological characteristics includes shapes ,colony& microscopic characteristics for both.

Course Reading List and References

Main references	Useful references	Magazines and review (Internet)
-Cowan M.K and Talaro K.P(2006). Microbiology a systems Approach.McGraw-Hill.	**Burton E.P and Michael J.L(1999).**Exercises for the Microbiology Laboratory.Morton Publishing CompanyUnited States of America	Indian journal of microbiology
-Kinaka Sharma (2008). Manual of Microciology Tools& Techniques.Second Edition.Ane Books India.	**Talaro K.and T.Arthur(1996).** Foundation in Microbiology Basic principles.	http://www.microbiology-journal.com

	Time Mirror Higher Education Group,Inc.	
-Prescott L.M.,,Harley J.P.and Klein D.A.(2005). Microbiology 6th ed.WCB/McGraw-Hill.		http://www. e-journal.org/.microbiology/
Johnson, T.R. and Case, C.L. (2007). Laboratory Experiments in Microbiology		
Benson, A.E. (2005). Bensons .microbiological Applications		
Atlus, Ronald M., Lawrence C. Parks and Alfred E. Brown (1995) Laboratory Manual of Experimental Microbiology		

Syllabus

No.	Title of the Subject	Lecturer's name
Week 1	Coarse book & Lab. Safety	Berivan Kayfi & khalid Esmehel Aziz
Week 2	Microscope	Berivan Kayfi & khalid Esmehel Aziz
Week 3	Control of microorganisms by physical method	Berivan Kayfi & khalid Esmehel Aziz
Week 4	Control of microorganisms by Chemical methods	Berivan Kayfi & khalid Esmehel Aziz
Week 5	Culture media &Streak plate method	Berivan Kayfi & khalid Esmehel Aziz
Week 6	Exam	Berivan Kayfi & khalid Esmehel Aziz
Week 7	Bacterial cultural characteristic or morphology	Berivan Kayfi & khalid Esmehel Aziz
Week 8	Bacterial staining –Simple staining	Berivan Kayfi & khalid Esmehel Aziz

Week 9	Gram staining	Berivan Kayfi & khalid Esmehel Aziz
Week 10	Fungi	Berivan Kayfi & khalid Esmehel Aziz
Week 11	Antimicrobial susceptibility test	Berivan Kayfi & khalid Esmehel Aziz
Week 12	Streptococcus sp.	Berivan Kayfi & khalid Esmehel Aziz
Week 13	*Escherichia coli*	Berivan Kayfi & khalid Esmehel Aziz
Week 14	*Staphylococcus sp*	Berivan Kayfi & khalid Esmehel Aziz
Week 15	Exam	Berivan Kayfi & khalid Esmehel Aziz

Note

All lectures are explained by power point, animation and video, also white board will be used for explanation.

Students are required to conduct two exams in fall semester in the practical microbiology part. The mean of two exams will be out of (25) marks, (5) marks for preparing reports and (5) for daily quizzes with general total (35) marks.

Pattern of questions and answers

Salahaddin University Sub: Agriculture Engineering Science (Practical)

College: Science of Agriculture Engineering Second stage

Dept. of Fish Resources and Aquatic Animal

Time: 1 hr

Date: / /

Q1:A Define the following terms: (Answer only four) (20marks)

1- Microscopy

2- Fungi

3- Sterilization

4- Culture medium

5- Mycelium

Q1:B Explain step the Preparation of Smear in liquid media in detail (18 marks)

Q2:A chooses the correct answer of the following: (15marks)

1- Used to make large changes in focus.

A (Fine adjustment) , **B** (Condenser) , C (Coarse adjustment) .

2- Used to Kill bacteria, fungi, but not endospores or naked viruses.

A (Chlorine) , **B** (Alcohols) , C (Hydrogen Peroxide) .

3- Example of Differential Media.

A (chocolate agar) , **B** (MacConkey s Medium) , C (Simmon citrate medium) .

4- Used for sterilization of an article not stand heat as gloves, plastic syringes.

A (Ultraviolet radiation) , **B** (gamma rays) , **C** (Hot air oven) .

5- used for sterilization mouth of culture tubes.

A (Red Heat) , **B** (Flaming) , C (Hydrogen Peroxide) .

Q2:B What are the main differences between differential and selective media? (20marks)

Q 3 Write the reason of the following: (27marks)

1- Oil immersion objective

2- why used agar more than gelatin in media?

3- why Staining microbial cells is important?

Answers:

Q1/

1-Microscope: is an optical instrument comprised of one or more lenses and is used to enlarge and/or magnify images of microscopic objects

2- Fungi: A fungus (plural: fungi) is a kind of living organism yeasts, moulds and mushrooms are types of fungi. The fungi are a separate kingdom of living things, different from animals and plants. Fungi have cells with nuclei. Their cell walls contain chitin& ergosterol .

3- Sterilization: can be defined as any process that effectively kills or eliminates such as fungi, bacteria, viruses and spore forms from a surface, equipment, or biological culture medium..etc.

4- Culture medium: A growth medium or culture medium is a liquid or gelatinous substance containing nutrients that used for culturing different microorganisms.

5- Mycelium: they branch and fusing with one another the mass of branched hyphae.

6-**Agar:** (carbohydrate) hydrocolloid derived from red algae. Agar is used because of its unique physical properties (it melts at 100°C and solidifies at 40°C the temperature at which it gels) and because it cannot be metabolized by most bacteria.

Q2 1- If the culture is taken from solid (agar) medium:

1. Place a very small drop of distilled water on the surface of the slide.
2. Remove a small amount of the culture from the agar surface and just touch it several times to the drop of water until it just turns cloudy.
3. Burn the remaining bacteria off of the loop.
4. Using the loop, spread the suspension over the entire slide to form a thin film.
5. Allow this thin suspension to completely air dry.
6. Pass the slide through the flame of the bunsen burner 3 or 4 times to heat-fix.

2-If the organism is taken from a broth culture:

1. Place 2 or 3 loops of the culture on a clean slide. Do not use water.

2. Using the loop, spread the suspension over the entire slide to form a thin film.
3. Allow this thin suspension to completely air dry.
4. Pass the slide through the flame of the bunsen burner 3 or 4 times to heat-fix.

Q3/1-Culture media, Enzymes, Vaccines, Antibiotics

2- Bacteriological loops ,needles,Tips of forceps

3- Milk , juice

Q4/A 1- The oil is used because it has same refractive index as glass, which prevents the loss of light due to the bending of light rays as they pass through air. The use of oil in this way enhances the resolving power of the microscope

2- Heat Fixation

Heat is required to fix the bacteria smear on the slide

because heat fixation step denatures bacterial proteins causing the cells to stick to the slide, heat denatures the proteolytic enzyme and prevent autolysis also killing the bacteria. . Heat fixation generally preserves overall morphology but not internal structures

Q4/B Differential Media (indicator media): It differentiate between two groups of bacteria (distinguish one microorganism type from another growing on the same media), for example, blood agar, MacConkeys Medium .

Selective Media: In this media an inhibitory substance is added to the media which prevents growth of all organisms except the one for which it is designed. for example, Mannitol salt agar