

Study Guide for Microbiology

Laboratory Exam I

Introduction to Microbiology – Effectiveness of Handwashing: Review information relative to lab safety, sanitation, handling and proper discard of microorganisms and contaminated materials. Recognize the significance of handwashing, normal and transient microbiota, and be able to interpret data obtained during the handwashing exercise.

Microscopic Technique and Measurement: Be familiar with written information about microscope operation (lenses, focus, lighting, etc.). Know the significance of calibration and be able to calibrate the ocular micrometer using four different objective lenses. Be able to measure microorganisms accurately at various magnifications.

Culture of Microorganisms and Media Preparation: Review information relative to the culture of microorganisms in vitro, composition of media and types of media (liquid and solid; complex and defined). Know how to prepare media given information on a medium container (read label).

Aseptic Technique and Streak Plate Preparation: Be able to define aseptic technique and know how and when it is applied (loop, plates, tubes, etc.). Be able to explain the purpose of streaking microbial cultures on agar plates. Be able to recognize properly streaked plates.

Isolation of a Pure Bacterial Culture: Know what is meant by and be able to recognize a pure culture. Know what is meant by colony morphology, and be able to describe the cultural characteristics of colonies using correct terminology as provided in the laboratory syllabus.

Staining - Direct and Indirect: Know the difference between direct and indirect stains, and the advantages/disadvantages of staining microorganisms. Be familiar with cell morphology (size, shape and arrangement) and be able to use the correct terminology to describe these features.

Staining - Gram Stain (KOH test): Know the composition of bacterial cell walls and the functions of stain reagents used in the Gram stain (crystal violet, Grams iodine, acetone-alcohol and safranin). Be able to recognize Gram-negative and Gram-positive cells. Be familiar with the KOH test, i.e., what is being tested for, and how the test works. Be able to recognize and/or describe positive and negative KOH test results.

Staining - Acid-Fast, Endospore, Capsule & Flagellar Stains: Review information presented on acid-fast cells, endospores and capsules. Know which stain reagents are used (carbol fuchsin, malachite green, crystal violet), and be able to recognize slide preparations of acid-fast cells, endospores (include shape, location and if or not the sporangium is swollen), capsules and flagella (amphitrichous and peritrichous).

Introduction to Selected Bacteria/Cyanobacteria: Be able to define enrichment, name three different soil genera that we enriched for, and explain the techniques used in their enrichment (what we used and why it worked). Be able to recognize and identify prepared slides of cyanobacteria. Domain Bacteria (formerly Kingdom Monera or Prokaryotae), phylum Cyanobacteria - Genera, *Nostoc*, *Oscillatoria*, *Gloeocapsa*, *Spirulina* & *Anabaena*.

Introduction to Fungi: Review written information on fungi, and be able to identify (name) the specific fungi genera observed in class. Be able to recognize and name the sexual and asexual spores of representative fungi. Be able to describe the taxonomy of examples of fungi as follows (remember that sexual spore type determines phylum):

Domain Eukarya - Kingdom Fungi (Myceteae)

Phylum Oomycota, - *Albugo bliti* and *Saprolegnia*

Phylum Zygomycota, - *Rhizopus stolonifer*

(All of the examples above produce asexual sporangiospores.)

Phylum Ascomycota, - *Saccharomyces cerevisiae* (ascospores and buds)

Morchella esculenta & *Claviceps purpurea* (ascospores only) *Penicillium chrysogenum* and *notatum*, *Aspergillus niger*, *flavus*, and *glaucus* (ascospores and conidiospores)

Phylum Basidiomycota - *Coprinus comatus* (basidiospores only)

Introduction to Algae & Protozoa: Review written information on algae and protozoa. Be able to identify, name and explain the taxonomy of examples as follows:

Domain Eukarya - Kingdom Protista (microscopic algae)

Phylum Chlorophyta - *Chlamydomonas* and Desmids (single-celled)

Spirogyra, *Oedogonium* and *Ulothrix* (filamentous) *Cladophora* (branching filaments)

Phylum Bacillariophyta - Diatoms (type slide)

Phylum Pyrrophyta, Dinophyta or Dinoflagellata (your choice) - *Peridinium* & *Ceratium*

Domain Eukarya – Kingdom Protista (Protozoa)

Phylum Archaezoa – *Giardia lamblia/ intestinalis* and *Trichomonas vaginalis*

Phylum Amoebozoa – *Amoeba proteus* and radiolarians (mixed genera)

Phylum Apicomplexa

Class Sporozoea - *Plasmodium vivax/ malariae/ ovale/ falciparum/ knowlsei*

Phylum Ciliophora - *Paramecium caudatum, aurelia* or *bursaria*

Phylum Euglenozoa – *Euglena* and *Trypanosoma lewisi/ gambiense/ cruzi*

Introduction to Multicellular Parasites: Review written information on parasites. Be able to identify, name and classify the following examples:

Domain Eukarya - Kingdom Animalia

Phylum Platyhelminthes (flatworm endoparasites)

Class Trematoda - *Fasciola hepatica* (rediae, and cercariae) and *Schistosoma hematobium, mansoni* and *japonicum* (cercariae only)

Class Cestoda - *Taenia pisiformis, solium* and *saginata* (adult tapeworm with scolex)

Phylum Aschelminthes (roundworm endoparasites)

Trichinella spiralis (larvae in muscle tissue) *Necator americanus* or *Ancylostoma duodenale* (infective larvae), *Onchocerca volvulus* (microfilariae in adult worms), *Dirofilaria immitis* (microfilariae in blood smear)

Phylum Arthropoda (ectoparasites – vectors of disease-causing agents)

Dermacentor andersoni (Rocky Mountain wood tick), *Ixodes dammini* (deer tick), *Sarcoptes scabiei* (itch mite), *Pediculus humanus capitis* (head louse) *Xenopsylla cheopis* (rodent flea - plague vector), *Culex pipiens* (mosquito)

Food Microbiology - Fermented and Cultured Foods: Be able to name the food products we made in lab, the microorganisms associated with each, and the fermentation products made.

Sauerkraut - *Leuconostoc mesenteroides*, *Lactobacillus brevis* & *plantarum* (lactic acid)

Apple wine and root beer – *Saccharomyces cerevisiae* (ethanol and carbon dioxide)

Cheese – *Lactococcus lactis* subspecies *lactis* and *cremoris* (lactic acid)

Yogurt – *Lactobacillus d. bulgaricus* and *Streptococcus thermophiles* (lactic acid & acetaldehyde)

Know the difference between ripened, unripened, soft and hard cheeses. Review the health benefits of yogurt consumption. Be familiar with the food-borne and water-borne agents of diseases described in the lab syllabus and which ones cause infection vs. intoxication.