

STUDY GUIDE

Pre-requisite Material

(Will appear on Exam 1)

1. Definitions

atom	organic
proton	inorganic
electron	genotype
neutron	phenotype
molecule	helicase
ion	gyrase
active transport	DNA polymerase
endocytosis	RNA polymerase
phagocytosis	mutation
pinocytosis	mutagen
ATP	
enzyme	
reactant (substrate)	
product	

2. Be able to list and use the conversion factors for metric units for length, volume, and weight (mass), including conversions between metric & English units. Be able to make conversions similar to the example problems in the lab manual. (Lab Manual Appendix C can help you.)
3. Be able to describe the function of the following cellular components: cell membrane, endoplasmic reticulum (RER & SER), ribosomes, Golgi bodies, mitochondria, lysosomes, cell wall, chromosomes, nucleus.
4. Be able to list or recognize the taxa (kingdom, phylum, class, etc.) in order.
5. Be able to list the characteristics of the five kingdoms: Plant, Animal, Fungi (Myceteae), Protista, and Prokaryotae (Monera). Also be able to list which organisms (protozoa, bacteria, yeasts, molds, worms, people, trees) are found in each.
6. Be able to define monomer and polymer. Be able to provide and recognize examples for carbohydrates, nucleic acids, and proteins. (E.g. amino acids are examples of monomers that can form protein polymers).
7. Be able to define the function of enzymes. Be able to briefly describe how enzymes perform this function. Be able to recognize names of enzymes (end in -ase).
8. Be able to define the levels of structure in proteins (primary, secondary, etc.).

9. Be able to describe how a DNA molecule can replicate itself using complementary pairing of nucleotides (adenine, cytosine, guanine & thymine).
10. Be able to differentiate the outcomes of mitosis and meiosis. Understand the concepts of Mendelian genetics well enough to predict the outcome of genetic crosses dealing with dominant/recessive, sex-linked traits, and multiple alleles.

STUDY GUIDE 1
Introductory Microbiology

"Chance favors the mind that is prepared"
-Louis Pasteur

NOTE: Topics marked with a "B" are explained well in the textbook and will not be covered in lecture.

1. Definitions: Be able to define the following terms. Do not rely entirely on the textbook glossary for definitions. Your definition should distinguish the term from any similar term in microbiology. Always include an example in the definition whenever possible.

	microbiology	culture (Lab)
	simple microscope	sterile (Lab)
	compound microscope	agar slant (Lab)
	peptidoglycan	differential media (Lab)
	teichoic acid	selective media (Lab)
	outer membrane	general purpose media (Lab)
B	periplasmic space	enriched media (Lab)
	lipopolysaccharide (LPS)	colony (Lab)
	lipid A	pure culture (Lab)
	axial filaments = endoflagella	mixed culture (Lab)
	= periplasmic flagella	contaminated culture (Lab)
	atrichous	aerosol (Lab)
	monotrichous	simple stain (Lab)
	lophotrichous	differential stain (Lab)
	amphitrichous	negative stain (Lab)
	peritrichous	resolving power = resolution (Lab)
	Brownian motion	magnification (Lab)
	vital movement	fluorescence (Lab)
	70s ribosome	
	80s ribosome	

2. Be able to recognize or list the contributions in microbiology from each of the following people: Antonie van Leeuwenhoek, Edward Jenner, Louis Pasteur, Robert Koch, Ignaz Semmelweis, Joseph Lister, Paul Ehrlich and Alexander Fleming.
3. Be able to describe the experimental method. Be able to develop hypotheses and your own experiments with control groups. Be able to distinguish among the scientific terms: hypothesis, theory, experimental variable, control variable. (Lab)
4. Be able to describe and apply Koch's postulates.

5. You will be responsible for always using the proper rules of nomenclature when writing scientific names. (See Appendix F of lab manual.)
- B 6. Be able to list or describe the differences between eukaryotic and prokaryotic cells.
- B 7. Be able to describe the structure and function of the following cellular components: capsules, flagella, axial filaments, pili, fimbriae, storage granules, endospores.
8. Be able to list reasons for various safety regulations in lab. (Lab Manual Appendix A)
9. Be able to list or identify the different morphological shapes and arrangements of bacteria (e.g. streptococcus, bacillus, spirochete, etc.). Also be able to provide medically important examples (genus & species).
10. Be able to identify the various parts of the compound light microscope (e.g. condenser, ocular, etc.) and describe their function. (Lab)
11. Be able to describe or recognize the use for different kinds of microscopes (e.g. darkfield, fluorescent, scanning electron, etc.). (Lab)

Journal #1

Describe Koch's postulates and apply them to a specific example.

Journal #2

Diagram in detail the gram positive and gram negative cell walls in bacteria showing the similarities & differences. Explain why certain layers of the prokaryotic cell wall are medically significant.

Journal #3

Compare and contrast prokaryotic cells and eukaryotic cells. Why these differences important in medicine?

STUDY GUIDE 2
Metabolism, Genetics, Growth

1. Definitions:

capsid		R plasmid
bacteriophage		transposon
lysogenic bacteria		restriction endonuclease
plaque [viruses]		DNA ligase
prophage	B	parasitism
envelope [viruses]	B	commensalism
peplomers	B	mutualism
RNA polymerase	B	bacteriocin
transcription	B	saprotroph = saprophyte = saprobe
translation		aerobes
m-RNA		microaerophiles
t-RNA		anaerobe
r-RNA		facultative
codon		hypertonic
anticodon		hypotonic
horizontal (= lateral) gene transfer		isotonic
transformation	B	halophile
transduction		plasmoptysis
conjugation		plasmolysis
plasmid	B	endoenzymes
F+ cell	B	exoenzymes
F- cell		
Hfr cell		

2. Be able to use the Genetic Code (e.g. Pg. 267, 5th ed./Pg. 269, 6th ed.) to determine a sequence of amino acids in a protein from a sequence of nucleotides in m-RNA or even from DNA.

3. Be able to describe the steps of PCR (Polymerase Chain Reaction).

4. Be able to describe the steps of genetic engineering, including definitions of key terms.

5. Be able to define and provide an example of a palindromic sequence of DNA.

B 6. Be able to identify or define different nutritional types of organisms: e.g. phototroph, heterotroph, chemoautotroph, etc.

7. Be able to define and list the differences between aerobic respiration and anaerobic fermentation.
- B 8. Be able to recognize or explain the relationship between pH numbers and the terms acid, base (alkaline) and neutral. Be able to list the ranges that are optimum for pathogenic bacteria and fungi.
9. Be able to convert between Celsius and Fahrenheit. Be able to define thermophile, mesophile & psychrophile.

Journal #4

Make a table listing all the differences between viruses and bacteria.

Journal #5

Be able to describe the process of protein synthesis including all the steps of transcription and translation. Be able to describe how rifampin, tetracycline, and erythromycin inhibit it in prokaryotic cells.

Journal #6

Make a pair of labeled diagrams showing an operon turned On vs. Off. Below the diagrams explain what each of the components of the operon do.

Journal #7

Describe the process of quorum sensing and biofilms (include autoinducers and the operon model). Tell how quorum sensing is important using examples.

STUDY GUIDE 3
Control of Microbes

1. Definitions:

B	sterilization		
B	sterile	B	exogenous infection
B	disinfection	B	endogenous infection
B	disinfectant	B	toxemia
B	sepsis	B	hyaluronidase
B	antiseptic	B	hemolysins
B	-cide	B	leukocidin
B	-static	B	streptokinase
B	pasteurization	B	prevalence
B	vegetative	B	incidence
B	antibiotic	B	local infection
	broad-spectrum agent	B	focal infection
	narrow-spectrum agent	B	systemic infection
	sensitivity test	B	mixed infection
	synergism	B	primary infection
	antagonism	B	secondary infection
	addition	B	chronic infection
	indifference	B	acute infection
	MIC	B	sign
B	beta-lactamase	B	symptom
	MRSA (CD-ROM)	B	standard precautions
	PPNG (CD-ROM)	B	nosocomial infection
	VRE (CD-ROM)		epidemiology
	MDR TB (CD-ROM)		sporadic
	superinfection		endemic
B	true pathogen		epidemic
B	opportunistic pathogen		pandemic
B	virulence		direct transmission
B	infection		indirect transmission
B	disease		aerosol
B	compromised host		droplet nuclei
	normal or resident or		fomite
	indigenous flora		passive or mechanical vector
	transient flora		biological vector
B	communicable disease		fecal indicator
		B	zoonosis

2. Be able to identify or list which microorganisms have the highest resistance, moderate resistance or least resistance to physical and chemical control.

- B 3. Be able to list the required time, pressure, and temperature for sterilization in an autoclave.
- B 4. Be able to list the time and temperature required for pasteurization with the batch (holding) method and the flash method. Be able to list milk-borne diseases that are controlled by pasteurization.
- B 5. Be able to briefly describe the following methods for controlling microorganisms. Be able to list the uses, advantages and/or limitations of each: UV light, X-rays, filtration, chlorine bleach, iodophor, ethylene oxide, silver nitrate.
6. For the following examples of chemotherapeutic drugs be able to tell the mechanism of action: Penicillin G, Isoniazid (INH), Rifampin, Tetracycline, and Erythromycin.
7. Be able to recognize or list the important microorganisms that are indigenous to the following body areas: Skin, nose, throat, mouth, stomach, intestine, and urogenital tract. Especially be able to list resident opportunists and the endogenous infections they can cause.
- B 8. Be able to define or differentiate various terms used to describe carriers (e.g. convalescent carrier, incubation carrier, etc.)
- B 9. Be able to list all the differences you can between endotoxins and exotoxins (ie. definitions, examples, which can be made into toxoids, etc.)
- B 10. Be able to describe the various phases of the growth curve.
11. Be able to describe the dilution technique for determining the number of living bacteria in a culture. Be able to make calculations of the numbers of bacteria and other problems in the computer program "Counting Microbes". (Lab & CD-ROM)

Journal #8

Describe how antimicrobial drugs can disrupt normal flora and lead to a superinfection by opportunists.

Journal #9

Describe how bacteria develop resistance to antibiotics and how this resistance becomes more common through natural selection. Be able to correct misconceptions about drug resistance.

STUDY GUIDE 4
Immunology

1. Definitions

- B lysozyme
 - B PMN's (polymorphonuclear cells)
 - serum
 - plasma
 - lymph
 - B lymph node
 - humoral immunity
 - cell-mediated immunity
 - antigen (Ag)
 - antibody (Ab)
 - complement
 - B interferon
 - B vaccine
 - B herd immunity
 - toxoid
 - attenuated
 - gamma globulins = immunoglobulins
 - antiserum
 - antitoxin
 - B titer
 - precipitation
 - agglutination
 - B opsonins
 - Agammaglobulinemia
 - DiGeorge's Syndrome
 - SCID
 - B type I allergy (immediate hypersensitivity)
 - B type IV allergy (delayed hypersensitivity)
 - B histamine
 - B allergen
- B 2. Be able to recognize or list examples of the First-line Defenses (physical barriers) and Second-line Defense (internal defenses) of nonspecific resistance.
- B 3. Be able to describe the causes, benefits, and signs/symptoms of inflammation.
- B 4. Be able to describe the function of the following blood cells: neutrophils, eosinophils, basophils, mast cells, lymphocytes, plasma cells, B-cells, T-cells, monocytes, and macrophages.

- B 5. Be able to distinguish between the following classes of antibodies: IgG, IgM, IgA, IgE, IgD.
6. Be able to describe the following serological tests: Complement Fixation Test, direct and indirect Fluorescent Antibody (FA) tests, and indirect ELISA test. (Lab & CD-ROM).
7. Be able to describe the mechanism behind the ABO blood system. Be able to tell who can donate to whom. (Lab)
8. Be able to describe how the condition of erythroblastosis fetalis occurs and how it can be prevented immunologically. (Lab)
- B 9. Be able to describe how allergy shots desensitize a person with allergies.
- B 10. Be able to identify the type of allergy involved in the tuberculin reaction test for tuberculosis.
- B 11. Be able to identify all the diseases for which vaccines are available (pg. 478, 5th ed./ pg. 471, 6th ed.).
- B 12. Be able to list which diseases are included in mixed vaccines, DTaP and MMR.
- B 13. Be able to describe what monoclonal antibodies are and how they are made.
- B 14. Be able to recognize or provide the names of autoimmune diseases listed in the handout on Blackboard. For each of these diseases be able to list the target self-antigen and describe the pathological result.

Journal #10

Be able to outline the steps involved in clonal selection and the development of immunological memory. In this process, be able to describe the interactions between T-cells, B-cells, dendritic cells, macrophages and interleukins.

Journal #11

Define the four categories of acquired immunity (natural active, artificial active, natural passive, and artificial passive). Be able to define them and be able to recognize examples of each.

Journal #12

Be able to describe how genetic engineering could be used to develop a vaccine for a specific disease.

STUDY GUIDE 5
Bacterial Diseases

1. Definitions:

	coagulase	B	Ziehl-Neelsen stain
	Group A streptococcus		AFB
	subacute endocarditis		Tuberculin test
	rheumatic fever		OT
	ASO test		PPD
	gamma hemolysis		BCG vaccine
	alpha hemolysis		mixed vaccine
	beta hemolysis		polyvalent vaccine
	PID		
B	infant botulism		

2. For all the important pathogenic microorganisms we cover in the remainder of the course, you should be able to provide the information outlined in the "Study Sheet for Pathogenic Microorganisms" that I put at the end of this study guide. (Here's another study suggestion. After filling out the Study Sheets, take a highlighter and highlight any unique or highly significant characteristics.) The important pathogens for this section are:

	<i>Staphylococcus aureus</i>	(Abscesses, toxic shock, sepsis, osteomyelitis, bronchopneumonia, food poisoning, etc.)
	<i>Streptococcus pyogenes</i>	(Strep throat, scarlet fever, sepsis, etc.)
B	<i>Streptococcus pneumoniae</i>	(Lobar pneumonia, otitis media, etc.)
	<i>Neisseria gonorrhoeae</i>	(Gonorrhoea)
B	<i>Neisseria meningitidis</i>	(Septic meningitis)
B	<i>Bacillus anthracis</i>	(Anthrax)
B	<i>Clostridium tetani</i>	(Tetanus)
	<i>Clostridium difficile</i>	(Antibiotic-associated colitis)
	<i>Clostridium botulinum</i>	(Botulism)
	<i>Mycobacterium tuberculosis</i>	(Tuberculosis)
B	<i>Bordetella pertussis</i>	(Pertussis or whooping cough)
B	<i>Pseudomonas aeruginosa</i>	(Burn infections, skin infections, swimmer's ear)
	<i>Legionella pneumophila</i>	(Legionnaire' s disease or legionellosis, Pontiac Fever)

B 3. Be able to identify the genus & species of bacteria that causes the following diseases: diphtheria, gas gangrene, leprosy or Hansen's disease.

4. Be able to differentiate or define prefixes for toxins: endo-, exo-, entero-, neurotoxin.
5. Be able to describe the basis of the tuberculin skin test including what type of hypersensitivity produces a positive reaction.

Journal #13

Complete the mid-semester review Crossword Puzzle in Blackboard and include it in your Journal.

Journal #14

Make a table comparing & contrasting Staph food poisoning, Salmonellosis and Botulism in terms of the following: microbe name, type of food poisoning, type of toxin, signs/symptoms (illness), incubation, fatal?, types of food involved, and prevention.

Journal #15

Describe the treatment strategy for tuberculosis. Include a discussion of the following: compliance problems, mutation, natural selection, MDR-TB, and solutions (e.g. DOT).

Journal #16

Explain the factors that contribute to C diff causing nosocomial infections and describe actions that can be taken to prevent these infections.

STUDY SHEET FOR PATHOGENIC MICROORGANISMS

Etiologic agent: _____

Morphology: _____

Disease(s):

Transmission:

Laboratory Diagnosis:

Treatment:

Vaccine:

STUDY GUIDE 6

More Bacteria, Parasites, Fungi

1. Definitions

	EMB agar		definitive host
	electrolytes		intermediate host
	ORT		paroxysm (in malaria)
B	coliform		relapse (in malaria)
	cardiolipin		gynecophoral canal
	Reiter protein		cercaria
	Hunterian chancre		miracidia
	gummas		mycosis (plural = mycoses)
	reagin		yeast
	heterophile antibody		mold
	BFP		budding
	NGU	B	hypha (plural = hyphae)
B	extraintestinal amoebiasis		dimorphic
B	trophozoite		ringworm
	dioecious	B	coccidioidin test
	monoecious		pseudohyphae

2. The important pathogens for this section are:

	<i>Salmonella typhi</i>	(Typhoid fever)
	<i>Shigella dysenteriae</i>	(Bacillary dysentery)
B	<i>Escherichia coli</i>	(UTI's, traveler's diarrhea)
	<i>Treponema pallidum</i>	(Syphilis)
B	<i>Rickettsia rickettsii</i>	(Rocky mountain spotted fever)
	<i>Chlamydia trachomatis</i>	(NGU, trachoma, lymphogranuloma venereum)
	<i>Plasmodium falciparum</i>	(Malaria)
B	<i>Toxoplasma gondii</i>	(Toxoplasmosis)
	<i>Schistosoma mansoni</i>	(Blood Fluke)
B	<i>Coccidioides immitis</i>	(Valley fever)
	<i>Candida albicans</i>	(Thrush, vaginitis, etc.)

B 3. Be able to identify the genus & species of microbe that causes the following diseases: cholera, giardiasis, amoebic dysentery, flagellate vaginitis, pork tapeworm.

4. Briefly be able to describe the diagnostic usefulness of lactose fermentation in gram negative enteric bacilli.

5. Be able to describe the process for the following syphilis tests and whether they are treponemal or non-treponemal: Reiter Protein Complement Fixation Test, FTA, Wasserman, & RPR.
 6. Be able to describe the different stages of syphilis.
 7. Be able to diagram the life cycle of malaria. In the life cycle you should identify the definitive and intermediate host and which organs in these hosts the parasites infect. Be able identify which part of the life cycle is responsible for the repeating chills & fever of malaria versus the relapses or recurrences in malaria.
- B
8. Be able to differentiate the life cycles of the following helminth parasites: hookworm, trichinosis worm, pinworm, blood fluke, & pork tapeworm. Especially be able to describe how the parasite infects humans, how it leaves our body, and what intermediate hosts (if any) are involved.
 9. In the parasitology lab exercise several helminth and protozoans will be studied. Be able to classify these parasites into one of the following categories: amoeba, flagellate, sporozoan, roundworm, fluke, or tapeworm. (Lab)
- B
10. Be able to distinguish the sites of various tinea (ringworm) infections. (e.g. tinea capitis = head).
 11. Given a list of bacteria and a set of characteristics, be able to design and diagram a dichotomous key for identifying unknown bacteria. (Lab)

Journal #17

When testing for secondary syphilis the RPR test has a specificity of about 90% and a sensitivity of 100%. The FTA test has a specificity of 96% and a sensitivity of 100%. Define these terms and explain what they mean in terms of false positives and false negatives. Which test is used for screening and which for confirmation. Why?

Journal #18

Explain in detail how the carrier state of sickle cell anemia provides resistance for malaria.

STUDY GUIDE 7

Viruses

1. Definitions

teratogen

virus neutralization test

hemagglutination inhibition (HI) test

B whitlows

B Koplik's spot

B variola

Negri bodies

B arbovirus

universal (or standard) precautions

reverse transcriptase

provirus

reverse transcriptase inhibitors (AZT)

protease inhibitors

integrase inhibitors

HAART

oncogenic virus

B 2. Be able to describe the history of the control of smallpox. What features of smallpox made its eradication possible? Be able to discuss the pros and cons of vaccinating for smallpox?

3. Be able to describe the relationship between chickenpox and zoster.

4. Be able to describe the relationship between Epstein Barr Virus, mononucleosis & Burkitt's Lymphoma.

B 5. Be able to recognize examples of arbovirus transmitted diseases (e.g. Dengue fever, West Nile virus, yellow fever, viral encephalitis).

6. Be able to list or recognize opportunistic diseases associated with AIDS.

7. Be able to describe the epidemiology of HIV. How is it transmitted? Who are at high risk? How can it be prevented?

8. Be able to identify examples of oncogenic viruses.

9. The important pathogenic microorganisms for this section are . . .

	Herpes simplex type 1	(Cold sores, keratitis, etc.)
	Herpes simplex type 2	(Genital herpes)
	hepatitis viruses	(Hepatitis)
B	rubeola virus	(Measles)
B	mumps virus	(Mumps or infectious parotitis)
B	rubella virus	(Rubella or German measles or 3-day measles)
	HIV	(AIDS)
	influenza virus	(Influenza)
	cold virus (rhino virus)	(Colds)
B	rabies virus	(Rabies)
B	polio virus	(Polio)
	HPV	(Warts, cervical cancer)

Journal #19

Define prevalence rate and incidence rate. Compare these terms in genital herpes, which is a permanent infection without a cure.

Journal #20

Discuss the three classes of anti-HIV drugs we talked about in class and explain how they block various stages of the HIV life cycle.

Journal #21

Be able to describe how the influenza viruses change their antigens and how they can cause epidemics and pandemics to occur.