

B R O O K D A L E C O M M U N I T Y C O L L E G E

# Biology 213 Syllabus

## Microbiology



Updated FA2020 Biology Program  
STEM Institute

# Syllabus

**CODE:** BIOL 213

**TITLE:** Microbiology

**INSTITUTE:** STEM

**DEPARTMENT:** Biology

**COURSE DESCRIPTION:** The biology of pathogenic microorganisms will be stressed, emphasizing their microscopic and molecular aspects. Students will describe, in detail, the relationship existing between the host-parasite complex during the diseased state. They will also become acquainted with those characteristics which endow certain microbes with a pathogenic nature. Students will be able to list and characterize various pathogenic bacteria, viruses, and eukaryotic parasites (including fungi, algae, protozoa, and helminths). Isolation and identification techniques in microbiology will be mastered by the student in the laboratory. The role of chemotherapy, immunology and serology used to combat pathogens will be examined thoroughly. Finally, the homeostatic defense mechanism of the body, especially those against invading microorganisms, will be discussed in great detail.

**PREREQUISITES:** A grade of "C" or higher in BIOL 102 or BIOL 112.

**COREQUISITES:** None

**CREDITS:** 4

**LECTURE HOURS:** 3

**LAB HOURS:** 3

**REQUIRED MATERIALS:**

Talaro's *Foundations in Microbiology*, Chess, 11<sup>th</sup> edition, 2021, ebook with CONNECT LearnSmart & Virtual labs

**ADDITIONAL TIME REQUIREMENT:**

For information on Brookdale's policy on credit hour requirements and outside class student work refer to Academic Credit Hour Policy.

**COURSE LEARNING OUTCOMES:**

- Demonstrate knowledge of pathogenic microorganisms.
- Apply the scientific method in a laboratory research project in the isolation and identification of unknown microorganisms.
- Demonstrate knowledge of how chemotherapy, immunology, and serology are used to combat pathogens.

(Mathematical/Scientific Reasoning/Information Literacy)

**COURSE CONTENT:**

Unit One: Introduction to Microbiology and Taxonomy  
Unit Two: General Characteristics and Representative Examples of Prokaryotic & Eukaryotic Organisms, & Viruses  
Unit Three: Microbial Metabolism, Ecology, & Growth  
Unit Four: Microbial Genetics  
Unit Five: Antimicrobial Actions  
Unit Six: Microbe-Human Interactions  
Unit Seven: Survey of Microorganisms of Medical Importance

**GRADING STANDARD:**

Active and frequent participation in each chapter is required for optimum performance in this course. Students will be assessed based on their participation and performance in class and laboratory:

Lecture exams and quizzes: 75%

Laboratory assignments, quizzes, technique evaluation, practical exams: 25%

**A student must have an average of 65% or higher for the classroom component and an average of 65% or higher for the laboratory component of the course in order to earn a passing grade for the course.**

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Upon completion of the course, grades will be assigned as follows:

A = 92 – 100%	
A- = 89 - 91%	C+ = 76 – 78%
B+ = 86 – 88%	C = 70 – 75%
B = 82 – 85%	D = 65 – 69%
B- = 79 - 81%	F = <65%

**In calculating the course grade, 0.5 will round up to the next numerical grade and 0.4 will round down to the next lower numerical grade.**

A grade of C or higher is required in all prerequisite courses. Career studies courses must have a grade of C or higher to count toward the Mathematics / Science Program – Biology Option.

Students are permitted to withdraw from the course without penalty until approximately 80% of the semester is complete. Please see termschedule for the exact deadline.

At the end of the semester, application for an Incomplete may be made if a student with proper documentation needs to complete no more than one lecture exam and/or one laboratory practical. The granting of an Incomplete is at the discretion of the instructor. (Please see Instructor’s syllabus for additional Grading Policies.)

## **DEPARTMENT POLICIES:**

**Attendance/participation** during class and laboratory sessions is strongly recommended for optimum performance in biology courses.

**Lecture exams** will be given online and require Respondus Lockdown Browser.

**Laboratory practicals** will be given online during laboratory sessions, in accordance with schedules provided by the lab instructors. Laboratory practicals require Respondus Lockdown Browser.

Exams and practicals must be taken at the times designated by the instructor or laboratory instructor. A student who misses a lecture exam or laboratory practical must provide prior notification and proper documentation in order to take the exam or laboratory practical. The acceptance of said prior notification and proper documentation will be determined by the instructor.

**Documentation** must be provided within one week of the student’s return to the classroom for a make-up exam or laboratory practical to be scheduled. A student who is unable to provide proper documentation for a missed exam or laboratory practical will be given a grade of zero for that exercise. Students may not re-take exams or laboratory practicals on which they perform poorly.

Requirements for the completion of laboratory are listed in the laboratory responsibility sheets for individual courses. Requirements for course completion are listed in individual instructor syllabi.

## **COLLEGE POLICIES:**

As an academic institution, Brookdale facilitates the free exchange of ideas, upholds the virtues of civil discourse, and honors diverse perspectives informed by credible sources. Our College values all students and strives for inclusion and safety regardless of a student’s disability, age, sex, gender identity, sexual orientation, race, ethnicity, country of origin, immigration status, religious affiliation, political orientation, socioeconomic standing, and veteran status. For additional information, support services, and engagement opportunities, please visit [www.brookdalecc.edu/support/](http://www.brookdalecc.edu/support/)

For information regarding:

- ◆ Brookdale’s Academic IntegrityCode
- ◆ Student Conduct Code
- ◆ Student Grade AppealProcess

Please refer to the **STUDENT HANDBOOK AND BCC CATALOG.**

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## **NOTIFICATION FOR STUDENTS WITH DISABILITIES:**

Brookdale Community College offers reasonable accommodations and/or services to persons with disabilities. Students with disabilities who wish to self-identify, must contact the Disabilities Services Office at 732-224-2730 or 732-842-4211 (TTY), provide appropriate documentation of the disability, and request specific accommodations or services. If a student qualifies, reasonable accommodations and/or services, which are appropriate for the college level and are recommended in the documentation, can be approved.

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**ADDITIONAL SUPPORT/LABS:**

BIOL 213 course and laboratory resources are available in CANVAS, Brookdale's Learning Management System, available via the Brookdale website: [www.brookdalecc.edu](http://www.brookdalecc.edu)

Brookdale Biology Department course and program information is available on the Biology Department website:  
<https://www.brookdalecc.edu/stem-institute/biology/>

*The syllabus is intended to give student guidance in what may be covered during the semester and will be followed as closely as possible. However, the faculty member reserves the right to modify, supplement, and make changes as the need arises.*

# Syllabus

BIOL 213  
Course No.

Microbiology  
Title

# 1 of 7 Units

4  
Credits

Name of Unit: **INTRODUCTION TO MICROBIOLOGY AND TAXONOMY**

Textbook: Talaro's Foundations in Microbiology, 11<sup>th</sup> edition, Chapter 1

Method of Evaluation: Lecture Exams and Quizzes, Laboratory Practicals, Quizzes, and Project

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Objectives	Recommended Learning Experiences
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The student will be able to:

1. Define microbiology.

Class Discussion  
Textbook Readings: Chapter 1  
Section 1.1

2. Compare and contrast microorganisms: viruses, bacteria, protozoa, algae, fungi and helminths

Section 1.1

3. Describe units of measurement used for microorganisms.

Figure 1.4

4. Identify various branches in the field of microbiology.

Section 1.1 & Table 1.1

5. Describe the significance of microorganisms:  
-medically, environmentally and commercially/economically

Sections 1.2, 1.3 & 1.4

6. Recognize the contributions made by scientists to the field of microbiology, to include:

Section 1.5 & 1.1 Making Connections

Robert Hooke

Paul Ehrlich

Anton van Leeuwenhoek

Alexander Fleming

Francesco Redi

Ernst Chain & Howard Florey

Louis Pasteur

Selman Waksman

Robert Koch

Rebecca Lancefield

Joseph Lister

Avery, MacLeod & McCarty

Edward Jenner

James Watson & Frances Crick

Hans Christian Gram

Nathans, Smith & Arber

Elie Metchnikoff

7. Describe the contributions of Carolus Linnaeus (the "Father of Taxonomy"), Robert Whittaker, and Carl Woese to the field of taxonomy.

Section 1.6

8. Describe the current system of classification in biology:  
3 domains 5 kingdoms further categories

Section 1.6

9. Describe the classification of prokaryotes and viruses, to include the criteria used to classify microorganisms.

Sections 1.7 & 6.1, 6.3 & 6.3

10. Describe classification systems of prokaryotic domains in Bergey's Manual of Systematic Bacteriology 2<sup>nd</sup> ed.

Sections 1.7 & 4.6 (Tables 4.3 & 4.4)

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11. Describe the classification of eukaryotic organisms to include criteria used for each group. Section 1.7
12. Correctly use the universal system of scientific naming of organisms - binomial nomenclature Section 1.7
13. Demonstrate the ability to use dichotomous keys in the identification of microorganisms.

# Syllabus

BIOL 213  
Course No.

Microbiology  
Title

# 2 of 7 Units

4  
Credits

Name of Unit: **GENERAL CHARACTERISTICS AND REPRESENTATIVE EXAMPLES OF PROKARYOTIC AND EUKARYOTIC ORGANISMS, AND VIRUSES**

Textbook: Talaro's Foundations in Microbiology, 11<sup>th</sup> edition, Chapters 4, 5, & 6

Method of Evaluation: Lecture Exams and Quizzes, Laboratory Practicals, Quizzes, and Project

Objectives Recommended Learning Experiences

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The student will be able to:

Class Discussion  
Textbook Readings:

1. Compare properties and cell structures in prokaryotes and eukaryotes.

Section 4.1, and Table 5.4

2. Describe sizes, shapes, and arrangement of prokaryotes.

Section 4.5

3. Describe the following prokaryotic cell structures and their related functions:

Sections 4.1 – 4.4

a. Structures external to cell wall

1. Flagella
2. Axial Filaments (periplasmic flagella)
3. Pili and Fimbriae
4. Glycocalyx
  - a. capsule
  - b. slime layer

b. Cell wall

1. Functions
2. Composition & characteristics
3. Gram stain
4. Negative Stain

c. Structures internal to cell wall

1. Plasma membrane
2. Cytoplasm
3. Nucleoid – chromosome
4. Plasmid
5. Ribosomes
6. Inclusions
7. Endospores

4. Describe biofilms and explain their significance

Section 4.2 Process Fig. 4.12

5. Survey prokaryotic groups with unusual characteristics

Section 4.7

6. Describe the history of eukaryotic cells including the endosymbiotic hypothesis/theory

Section 5.1





# Syllabus

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#3 of 7 Units

4  
Credits

Name of Unit: **MICROBIAL METABOLISM, ECOLOGY, AND GROWTH**

Textbook: Talaro's Foundations in Microbiology, 11<sup>th</sup> edition, Chapters 2, 7, & 8

Method of Evaluation: Lecture Exams and Quizzes, Laboratory Practicals, Quizzes, and Project

Objectives	Recommended Learning Experiences
The student will be able to:	Class Discussion Textbook Readings:
1. Review composition, properties, and functions of macromolecules.	Chapter 2
2. Describe major categories of nutritional types among organisms.	Sections 7.1, 7.2 & Table 7.2
3. Define requirements for microbial growth including -Micronutrients, macronutrients, essential nutrients -Physical and Chemical Requirements Carbon, oxygen, water, phosphate, nitrogen, sulfur Temperature Osmotic Pressure pH	Sections 7.1 & 7.4 & Table 7.1
4. Define bacterial growth.	Section 7.6
5. Define generation time or doubling time in prokaryotes	Section 7.6
6. Name and describe the stages in the bacterial growth curve.	Section 7.6 Figure 7.18
7. Discuss direct and indirect methods of analyzing bacterial population growth.	Section 7.6
8. Discuss the range of ecological associations among microorganisms and interrelationships between microbes and humans.	Section 7.5
9. Describe the development and significance of biofilm association.	Section 7.5 & Process Figure 4.12
10. Define metabolism. Describe the following: -catabolism and anabolism -role of ATP -metabolic pathways -enzymes and enzyme action -factors influencing enzymatic activity -oxidation-reduction reactions -generation of ATP	Sections 8.1 & 8.2
11. Demonstrate an understanding of the following metabolic pathways in microorganisms:	Sections 8.3, 8.4 & 8.5; Appendix A

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Carbohydrate catabolism

  Glycolysis

  Aerobic Respiration

    Bridge reaction (Transition or Preparatory step)

    Krebs Cycle

    Electron Transport Chain

  Anaerobic Respiration

  Fermentation reactions

Lipid and protein catabolism

Anabolic pathways

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# 4 of 7 Units

4  
Credits

Name of Unit: **MICROBIAL GENETICS**

Textbook: Talaro's Foundations in Microbiology, 11<sup>th</sup> edition, Chapters 2, 9, & 10

Method of Evaluation: Lecture Exams and Quizzes, Laboratory Practicals, Quizzes, and Project

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Objectives	Recommended Learning Experiences
The student will be able to:	Class Discussion Textbook Readings:
1. Describe the structure of the nucleic acids – DNA & RNA	Sections 2.8 & 9.1 Figure 9.6
2. Describe the relationships among DNA, gene, genome, chromosome, genotype, phenotype.	Section 9.1
3. Compare the genome of prokaryotes to that of eukaryotes.	Section 9.1
4. Describe the process of DNA replication in prokaryotes.	Section 9.1
5. Describe the process of RNA replication in prokaryotes.	Section 9.2
6. Describe the process of protein synthesis in prokaryotes.	Section 9.2
7. Explain the operon model of gene expression. Describe regulation of gene expression in bacteria by induction and repression.	Section 9.3
8. Define mutation. Describe types of mutations and categories of mutagens.	Section 9.4
9. Compare the mechanisms of genetic recombination in bacteria. Differentiate between horizontal and vertical gene transfer.	Section 9.5
10. Describe the functions of vectors (plasmids and phages) and transposons.	Section 9.5
11. Compare replication strategies in DNA and RNA viruses.	Section 9.6
12. Describe methods and applications of genetic engineering.	Chapter 10

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# 5 of 7 Units

4  
Credits

Name of Unit: **ANTIMICROBIAL ACTIONS**

Textbook: Talaro's Foundations in Microbiology, 11<sup>th</sup> edition, Chapters 11 & 12

Method of Evaluation: Lecture Exams and Quizzes, Laboratory Practicals, Quizzes, and Project

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## Objectives

## Recommended Learning Experiences

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The student will be able to:

Class Discussion  
Textbook Readings:

- |  |                                       |
|--|---------------------------------------|
| 1. Define and differentiate among the major terms for microbial control including <ul style="list-style-type: none"><li>• Sterilization</li><li>• Disinfection</li><li>• Antiseptic</li><li>• Sanitization</li><li>• Degermation</li></ul>                     | Section 11.1 Table 11.2               |
| 2. Identify factors that influence effectiveness of antimicrobial agents or methods.   | Section 11.1                          |
| 3. Identify the targets of antimicrobial control agents.   | Section 11.1                          |
| 4. Describe the actions and effects of physical and chemical agents or methods used to control microbial growth.   | Sections 11.2, 11.3 & 11.4            |
| 5. Describe antimicrobial drugs and distinguish between antibiotics, synthetics, and semisynthetics  | Section 12.1 & Table 12.3             |
| 6. Identify the primary sources of antibiotics.  | Section 12.1 & Table 12.2             |
| 7. Identify characteristics of ideal antimicrobial drugs.  | Table 12.1                            |
| 8. Describe the mechanisms of action of antimicrobial drugs.   | Section 12.1 & Table 12.4             |
| 9. Identify commonly used antibacterial drugs according to mode of action.   | Section 12.1 & Figure 12.2            |
| 10. Identify the modes of action and representative examples of major antimicrobial groups including: <ul style="list-style-type: none"><li>• Antibacterial drugs</li><li>• Antifungal drugs</li><li>• Antiparasitic drugs</li><li>• Antiviral drugs</li></ul> | Section 12.1, 12.2, 12.3 & Table 12.4 |
| 11. Describe the mechanisms of drug resistance   | Section 12.4                          |

- |   |                           |
|---|---------------------------|
| 12. Identify side effects of antimicrobial drug use in humans.          | Section 12.5 & Table 12.9 |
| 13. Discuss the effects of combining antimicrobial drugs.               | Section 12.6              |
| 14. Describe tests for microbial susceptibility to antimicrobial drugs. | Section 12.6              |

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# 6 of 7 Units

4  
Credits

Name of Unit: **MICROBE-HUMAN INTERACTIONS**

Textbook: Talaro's Foundations in Microbiology, 11<sup>th</sup> edition, Chapter 13

Method of Evaluation: Lecture Exams and Quizzes, Laboratory Practicals, Quizzes, and Project

Objectives	Recommended Learning Experiences
The student will be able to:	Class Discussion Textbook Readings:
1. Define the terms associated with infectious diseases.	Section 13.1
2. Define <b>normal microbiota</b> . Distinguish between resident and transient microbiota. Identify sites that harbor normal microbiota and those that are microbe-free.	Tables 13.1, 13.2 & 13.3
3. Discuss the major factors in the development of an infection including entry, adhesion, multiplication, effects. Compare endotoxins and exotoxins.	Section 13.2
4. Describe the clinical stages of disease.	Section 13.3
5. Discuss the patterns of infection and distinguish between localized and systemic, focal and mixed, primary and secondary, endogenous and exogenous infections.	Section 13.3
6. Use correct terminology to explain the manifestations (signs and symptoms) of infections and inflammation.	
7. Describe the transmission of disease by identifying reservoirs of infection, distinguishing between types of vectors, and types of carriers. Define zoonoses.	Section 13.4
8. Describe the transmission of disease. Distinguish between communicable, noncommunicable, and contagious diseases.	Section 13.4
9. Define nosocomial infections (HAIs) and explain their significance.	Section 13.5
10. Define epidemiology and explain the major methods of tracking infections and diseases in a population.	Section 13.5
11. Differentiate among the patterns of disease outbreaks according to frequency, number, location, and duration.	Section 13.5
12. Demonstrate a thorough understanding of Koch's Postulates.	13.5 Making Connections

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# 7 of 7 Units

4  
Credits

Name of Unit: **SURVEY OF MICROORGANISMS OF MEDICAL IMPORTANCE**

Textbook: Talaro's Foundations in Microbiology, 11edition, Chapters 17, 18, 19, 20, 21, 22,23,24, & 25

Method of Evaluation: Lecture Exams and Quizzes, Laboratory Practicals, Quizzes, and Project

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Objectives	Recommended Learning Experiences
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The student will be able to:

Class Discussion  
Textbook Readings:

1. Summarize common procedures used for identifying pathogens and diagnosing infections. Chapter 17

2. Describe each of the following bacteria to include:

- general characteristics: structure, arrangement, staining properties
- metabolic and pathogenic properties
- diseases caused in humans and locations in body

A. Gram-Positive cocci

1.) *Staphylococcus*

Section 18.1

2.) *Streptococcus*

Section 18.2

3.) *Enterococcus*

Section 18.2

B. Gram-Negative cocci

1.) *Neisseria*

Section 18.3

2.) *Moraxella*

Section 18.3

C. Gram-Positive endospore forming bacilli

1.) *Bacillus*

Section 19.2

2.) *Clostridium*

Section 19.2

D. Gram-Positive Regular Non-spore-forming bacilli

1.) *Listeria*

Section 19.3

E. Gram-Positive Irregular Non-spore-forming bacilli

1.) *Corynebacterium*

Section 19.4

2.) *Propionibacterium*

Section 19.4

F. Mycobacterium: Acid-Fast Bacilli

1.) *M. tuberculosis*

Section 19.5

2.) *M. leprae*

Section 19.5

G. Actinomycetes: Filamentous bacilli

1.) *Actinomyces*

Section 19.6

2.) *Nocardia*

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- H. Gram-Negative Aerobic Bacilli  
1.) *Pseudomonas*  
2.) *Burkholderia, Acinetobacter*  
3.) *Brucella*  
4.) *Francisella*  
5.) *Bordetella*  
6.) *Legionella*  
Sections 20.1 & 20.2
- I. Gram-Negative Facultative Anaerobic Bacilli  
- Family Enterobacteriaceae  
1.) Coliform Enteric Organisms: *E. coli*  
*Serratia*  
*Klebsiella*  
*Enterobacter*  
*Citrobacter*  
Sections 20.3 & 20.4  
2.) Noncoliform Enteric Organisms: *Proteus*  
*Providencia*  
*Morganella*  
Section 20.5  
3.) True Enteric Pathogens: *Salmonella*  
*Shigella*  
*Yersinia enterocolitica*  
Section 20.5  
4.) Nonenteric Organism: *Yersinia pestis*
- Family Pasteurellaceae  
1.) *Pasteurella*  
2.) *Haemophilus*  
Section 20.5
- J. The Spirochetes  
1.) *Treponema*  
2.) *Leptospira*  
3.) *Borrelia*  
Section 21.1
- K. Curviform Gram-Negative Bacteria  
1.) *Vibrio*  
2.) *Campylobacter*  
3.) *Helicobacter*  
Section 21.2
- L. Order Rickettsiales  
1.) *Rickettsia*  
2.) *Ehrlichia*  
3.) *Anaplasma*  
4.) *Coxiella*  
5.) *Bartonella*  
Section 21.3
- M. Family Chlamydiaceae  
1.) *Chlamydia*  
2.) *Chlamydophila*  
Section 21.3



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- N. Cell-Wall-Deficient Bacteria Section 21.3  
1.) *Mycoplasma*
3. Describe Fungi of Medical Importance to include: Chapter 22
- general characteristics
  - degree of pathogenicity
  - nature of infection (primary or secondary; true or opportunistic) and infecting form
  - habitat and geographic location
  - metabolic and pathogenic properties
  - organization of fungal diseases (mycoses)
  - characteristics of common antifungal drugs
- A. Systemic Fungal Pathogens Section 22.2  
1.) *Histoplasma*  
2.) *Coccidioides*  
3.) *Blastomyces*
- B. Subcutaneous Fungal Pathogens Section 22.3  
1.) *Sporothrix*
- C. Cutaneous Fungal Pathogens (Dermatophytes) Section 22.4  
1.) *Tricophyton*  
2.) *Microsporum*  
3.) *Epidermophyton*
- D. Opportunistic Fungal Pathogens Section 22.6  
1.) *Candida*  
2.) *Cryptococcus*  
3.) *Pneumocystis*  
4.) *Aspergillus*
4. Define terms associated with parasitology Chapter 23
5. Describe Parasites of Medical Importance to include Chapter 23
- general characteristics of each group of parasitic pathogens
  - portals of entry, habitat, geographic location
  - diseases caused in humans and location in the body
  - antiparasitic drugs of choice
- A. Protozoan Pathogens
- 1.) Amoeboid Protozoa Section 23.2  
a. *Entamoeba*  
b. *Naegleria*
- 2.) Ciliate Protozoan Section 23.2  
a. *Balantidium coli*

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- 3.) Flagellate (Mastigophoran) Protozoa Section 23.3
- a. *Trichomonas*
  - b. *Giardia*
  - c. *Trypanosoma*
  - d. *Leishmania*
- 4.) Apicomplexan Protozoa Section 23.4
- a. *Plasmodium*
  - b. *Toxoplasma*
  - c. *Cryptosporidium*
  - d. *Cyclospora*
  - e. *Babesia*
- B. Helminthic Pathogens Section 23.5
- 1.) Nematodes (Roundworms) Section 23.6
- a. *Ascaris*
  - b. *Trichuris trichiura*
  - b. *Enterobius*
  - c. *Trichinella*
  - d. *Wuchereria*
  - e. *Onchocerca*
  - f. *Loa loa*
  - g. *Necator americanus*
  - h. *Dracunculus*
- 2.) Trematodes or Flukes (Flatworms) Section 23.7
- a. *Schistosoma*
  - b. *Fasciola*
  - c. *Paragonimus*
- 3.) Cestodes or Tapeworms (Flatworms) Section 23.7
- a. *Taenia solium*, *T. saginata*
  - b. *Diphyllobothrium*
  - c. *Echinococcus*
6. Differentiate among the Arthropod vectors of infectious disease Section 23.8
7. Describe DNA and RNA Viruses that infect humans. Discuss Chapter 24
- general characteristics, identification, diagnosis, classification, effects of infection on host cells
  - diseases and location in the body
- A. Enveloped Double-stranded DNA Viruses
- 1.) Poxviruses (Poxviridae) Section 24.2
- a. *Variola*, *Vaccinia*

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- 2.) Herpesviruses (Herpesviridae) Section 24.3
  - a. Herpes simplex virus (HSV-1 and HSV-2)
  - b. *Varicella-Zoster Virus* (VZV)
  - c. *Epstein-Barr Virus* (EBV)
  - d. *Cytomegalovirus* (CMV)
  - e. *Herpesviruses* 6, 7, 8
  
- 3.) Hepadnaviruses (Hepadnaviridae) Section 24.4
  - a. *Hepatitis B Virus* (HBV)
  
- B. Nonenveloped Double-stranded DNA Viruses
  
- 1.) Papillomaviruses (Papillomaviridae) Section 24.5
  - a. Human Papillomavirus (HPV)
  
- C. Nonenveloped Single-stranded DNA Viruses
  
- 1.) Parvoviruses (Parvoviridae) Section 24.5
  - a. *Parvovirus (Erythrovirus)* 5<sup>th</sup> Disease
  
- D. Enveloped Segmented Single-stranded RNA Viruses
  
- 1.) Orthomyxoviruses (Orthomyxoviridae) (ss-) Section 25.1
  - a. *Influenza virus A, B, C*
  
- 2.) Bunyaviruses (Bunyaviridae) (ss-) Section 25.1
  - a. *Hantavirus*
  
- E. Enveloped Nonsegmented Single-stranded RNA Viruses
  
- 1.) Paramyxoviruses (Paramyxoviridae) (ss-) Section 25.2
  - a. *Paramyxovirus* (parainfluenza virus types 1-5 and mumps virus)
  - b. *Morbillivirus* (measles/rubeola virus) (ss-)
  - c. *Pneumovirus* (respiratory syncytial virus (RSV) (ss-))
  
- 2.) Rhabdoviruses (Rhabdoviridae) (ss-) Section 25.2
  - a. *Lyssavirus* (Rabies virus)
  
- 3.) Filoviruses (Filoviridae) (ss-) Section 25.2
  - a. Ebola virus
  - b. Marburg virus
  
- 4.) Coronaviruses (Coronaviridae) (ss+) Section 25.3
  - a. Coronavirus /Severe Acute Respiratory Syndrome Virus (SARS) (ss+)
  
- 5.) Togaviruses (Togaviridae) (ss+) Section 25.3
  - a. *Rubivirus* (Rubella/ German Measles))

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- b. *Alphavirus* (Yellow Fever, Eastern & Western Equine Encephalitis, Chikungunya virus, Zika) Section 25.4
- 6.) Flaviviruses (Flaviviridae) (ss+) Sections 25.3 & 25.4
  - a. *Flavivirus* (Dengue Fever virus, West Nile Fever virus, Hepatitis C virus (HCV))
- 7.) Picornaviruses (Picornaviridae) (ss+) Section 25.6
  - a. *Enterovirus* (Poliovirus, Coxsackie virus)
  - b. *Hepatovirus* (Hepatitis A virus (HAV))
  - c. *Rhinovirus* (*Common Cold virus*)
- 8.) Caliciviruses (Caliciviridae) (ss+) Section 25.6
  - a. *Calicivirus* / Norovirus (Norwalk agent)
- F. Double-stranded Nonenveloped RNA viruses
  - 1.) Reoviruses (Reoviridae) Section 25.6
    - a. *Rotavirus*
- G. Double-stranded Enveloped RNA viruses produce DNA using Reverse transcriptase
  - 1.) Retroviruses (Retroviridae) Section 25.5
    - a. *Lentivirus* (HIV)
    - b. *Oncornavirus* (Human T-Cell Lymphotropic virus I) (HTLV-1) (Leukemia)
- 8. Define Arbovirus; describe the pathology and mode of Transmission of arboviruses Section 25.4
- 9. Explain the pathogenesis, transmission, and epidemiology of prion diseases Section 25.7