**BI 102 Topic List and Suggested Activities**

**Using Openstax: Concepts Biology**

Chapter 4: How Cells Obtain Energy

* Kinetic vs potential energy, be able to recognize difference
* Laws of thermodynamics
  + Possible lab: Thermodynamic reactions
* Transferred vs transformed, oxidation and reduction
* Basic chemical reactions (Endergonic/exergonic, anabolic/catabolic)
* Collision theory
* Understand the role of enzymes and differences between inhibitors
* Effect of temperature, pH on systems enzyme activity
  + Possible lab: effects on enzyme activity
* Understand the flow of cellular respiration – aerobic and anaerobic
  + Possible lab: cellular respiration of sugar by yeast
  + Possible activity: metabolic survey (compare BMI, hip waist ration, BMR, etc)
* Understand fermentation, start and end product + differences in plants and animals

Chapter 5: Photosynthesis

* Autotroph vs heterotroph
* Plant anatomy
* Two stages in photosynthesis, what happens where
* Differences in Chlorophyll pigments and accessory pigments
  + Possible lab: plant pigments and photosynthesis
* Know the difference between photophosphorylation sys 1 & 2
* Unique adaptation of C3 plants; Benefit/cost of photorespiration
* Unique adaptation of C4 plants
* Unique adaptation of CAM plants

Chapter 13: Diversity of Microbes, Fungi, Protists

* Understand the endosymbiotic theory and lines of evidence
* Fundamental features shared by all cells and by the living
* Unique features of prokaryotes and eukaryotes \*\*
* Bacterial replication: binary fission, conjugation, transformation and transduction
  + Possible lab: transformation
* Differences and importance of gram stain
  + Possible lab: Gram stain
* Bacteria forms/shapes
* Biofilms – what is it and what is the advantage
* Antibiotics (utility and understanding resistance)
  + Possible lab: Kirby Bauer Assay
  + Possible lab: antiseptics vs disinfectants
  + Possible lab: hand washing
  + Possible lab: microbe inquiry survey
* Characteristics of fungi – unique feature of each subgroup
  + Possible activity: sample slides
* Characteristics of protists – unique features of subgroups
  + Possible activity: sample slides
* Structure of fungi

Chapter 14: Diversity of Plants

* Plant diversity
* Significance of anatomical features
* Understand the vascular system
  + Possible lab: water potential in turgid vs dehydrated plants
* Monocot vs dicot
  + Possible activity: plant ID with live specimens
* Flower structure/terms
* Recognize inbreeding vs outbreeding plants
* Evolutionary mechanisms to prevent self-pollination
* Double fertilization
* Types of fruit
  + Possible dissection of common fruit to identify parts
* Recognize types of tropism
  + Possible lab: phototropism (with plants or euglena)
* Function of various hormones
* Photoperiodism

Chapter 17: Viruses and the Immune System

* Anatomy of a virus – why it’s considered non living
* Host range
  + Possible lab: tobacco mosaic virus infectivity assay
* Replication cycle + Lytic vs lysogenic cycle
  + Possible lab: soil bacteriophage exploration
* Differences between virus, viroid and prions
* Understand differences between innate and adaptive immunity
* Antigen-antibody binding
  + Possible lab: ELISA
* Importance/mechanism of perforin and granzyme
* Understand what triggers NK cells to attack as opposed to T Cells
* Know the players and what stimulates them (B cells, T cells CD4 vs CD8)
* Understand what happens when the immune system fails or over-reacts
  + Possible lab: blood typing

Chapter 19: Population and Community Ecology

* Different ecology scopes (population, community)
  + Possible lab: estimating population size
* Community interactions (competition, partitioning, displacement, predation, etc)
  + Possible lab: competition between fungal cultures
* Recognizing and differentiating different symbiotic relationships
* Life histories (types, and which type benefits what organism)
  + Possible lab: population growth with lemna major
* Importance and significance of keystone species
* Prey defenses
* Carrying capacity
* Coevolution with pollinators

Chapter 20: Ecosystems and the Biosphere

* Different ecology scopes (ecosystem, biome)
* Trophic structure (levels and significance)
  + Possible lab: owl pellet dissections
  + Possible lab: efficacy of energy transfer between levels
  + Possible lab: sustaining ecosystems
  + Possible lab: aquatic primary productivity
* Chemical cycles (water, carbon, nitrogen, phosphorous) - role and impact
  + Possible lab: Soil analysis
* Genetic, species and ecosystem diversity – differences, how one is defined over another
* Unique species definitions (threatened, endangered, keystone, exotic, flagship, etc)
* Recognize the impact of topography and climate
  + Possible activity: Ecological site assessment (Web Soil Survey data set)
* Understand the concept of parallel universes in similar biomes across the globe and WHY that is, as well as the term for animals that are unique exceptions
* Unique traits of different biomes
  + Possible lab: biodiversity of biomes

Chapter 21: Conservation and Biodiversity

* Renewable vs non-renewable resources
* Species vs genetic diversity and WHY biodiversity is so important
  + Possible lab: calculate biodiversity indexes
  + Possible lab: Biodiversity and interdependence
* Threats to biodiversity
  + Possible lab: loss of biodiversity (Carolina)
  + Possible lab: testing water pollution
* Possible solutions to biodiversity threats
* Be able to explain the extinction vortex

\*\*Indicates it comes up in other sections/units well