AP Biology 12 Name:_____

Learning Intentions from the First Half Date:_____Block:____

In this handout, you will find all of the learning intentions that we covered in the first half of the AP Biology Program. Please take time throughout the year to refresh your learning by matching the learning intentions to those in your AP Biology Test Prep Series book. Use Holtzclaw, supplemented by Campbell, along with sample free response questions (http://www.collegeboard.com/student/testing/ap/biology/samp.html?biology) to refresh your learning. If you have any questions, please ask! You have me and your fellow students as resources. I will be more than happy to meet with any of you (individual or group) throughout the year to go over any topics (including the ones from this year).

So, **you must know:**

Unit 1 – Ecology

Learning Goals: What kind of interactions can organisms have between each other and their environment?

Concept 1: Analyzing Animal Behaviour

Animal Behaviour (Ch 51)

- The difference between kinesis and taxis
- Various forms of animal communication
- The role of altruism and inclusive fitness in kin selection

Lab 11: Animal Behaviour

- Some animal behaviours, such as orientation behaviour, agnostic behaviour, dominance display, or mating behaviour, and how they are adaptive
- How to design a controlled experiment

Concept 2: Ecology and Biosphere – Analyzing biome formation and characteristics

An Introduction to Ecology and the Biosphere (Ch 52)

- The role of abiotic and biotic factors in the formation of biomes
- Features of freshwater and marine biomes
- Major terrestrial biomes and their characteristics

Concept 3: Population Ecology – Analyzing density, dispersion, demographics, growth, and factors that affect growth.

Population Ecology (Ch 53)

- How density, dispersion, and demographics can describe a population
- The differences between exponential and logistic growth models of population growth
- How density-dependent and density-independent factors can control population growth

Concept 4: Community Ecology – Analyzing the interactions and relationships within and between species and the effects of environmental factors on species diversity and composition.

Community Ecology (Ch 54)

- The difference between a fundamental niche and a realized niche
- The role of competitive exclusion in interspecific competition
- The symbiotic relationships of parasitism, mutalism, and commensualism
- The impact of keystone species on community structure
- The difference between primary and secondary succession

Concept 5: Ecosystems – Analyzing productivity, energy flow, and chemical cycling.

Ecosystems (Ch 55)

- How energy flows though the ecosystem by understanding the terms that relate to food chains and food webs
- The difference between gross primary productivity and net primary productivity
- The carbon and nitrogen biogeochemical cycles

Lab 12: Dissolved Oxygen and Primary Productivity

- Factors that affect the amount of oxygen available in an aquatic ecosystem

- The relationship between dissolved oxygen, photosynthesis, respiration, and how these processes relate to primary productivity
- How to measure primary productivity based on changed in dissolved oxygen
- The effect of changing light intensity on primary productivity

Unit 2 – Mechanisms of Evolution

Learning Goal: What are the patterns and processes of Evolution?

Concept 1: Analyzing the modes of speciation (macroevolution)

The Origin of Species (Ch 24)

- The difference between microevolution and macroevolution
- The biological concept of species
- Prezygotic and postzygotic barriers that maintain reproductive isolation in natural populations
- How allopartic and sympatric speciation are similar and different
- How an autopolyploid or an allopolyploid chromosomal change can lead to sympatric speciation
- How punctuated equilibrium and gradualism describe two different tempos of speciation

Concept 2: Analyzing descent with modification

Descent with Modification: A Darwinian View of Life (Ch 22)

- How Lamarck's view of the mechanism of evolution differed from Darwin's
- Several examples of evidence for evolution
- The differences between structures that are homologous and those that are analogous, and how this relates to evolution
- The role of adaptations, variation, time, reproductive success, and heritability in evolution

Concept 3: Analyzing meiosis and sexual life cycles as a mechanism for genetic variation

Meiosis and Sexual Life Cycles (Ch 13)

- The differences between asexual and sexual reproduction
- The role of meiosis and fertilization in sexually reproducing organisms
- The importance of homologous chromosomes to meiosis
- How the chromosome number is reduced from diploid to haploid through the stages of meiosis
- Three important differences between mitosis and meiosis
- The importance of crossing over, independent assortment, and random fertilization to increasing genetic variability

AP Lab 3: Mitosis and Meiosis

- ~~The events of mitosis and meiosis in plant and animal cells~~
- How mitosis and meiosis differ
- ~~How to calculate the relative duration of each stage of mitosis~~
- The roles of segregation, independent assortment, and crossing over in generating genetic variation
- ~~How to calculate map distance from experimental data (later in genetics unit)~~

Concept 4: Analyzing the evolution of populations through Hardy-Weinberg (microevolution)

The Evolution of Populations (Ch 23)

- How mutation and sexual reproduction each produce genetic variation
- The conditions for Hardy-Weinberg Equilibrium
- How to use the Hardy-Weinberg equation to calculate allelic frequencies and to test whether a population is evolving

AP Lab 8: Population Genetics and Evolution

- The Hardy-Weinberg equation and be able to use it to determine the frequency of alleles in a population
- Conditions for maintaining Hardy-Weinberg equilibrium
- How genetic drift, selection, and the heterozygote advantage affect Hardy-Weinberg equilibrium

Unit 3 – Mendelian Genetics
Learning Goal: How are traits passed down from parents to offspring?

Concept 1: Analyzing the effects of classic Mendelan genetic crosses such as monohybrid, dihybrid, testcross, and applying to pedigree diagrams.

Mendel and the Gene Idea (Ch 14)

- Terms associated with genetics problems: P, F_1, F_2, dominant, recessive, homozygous, heterozygous, phenotypic, and genotypic
- How to derive the proper gametes when working a genetics problem
- The difference between an allele and a gene
- How to read a pedigree

Concept 2: Analyzing the effects of complex genetic crosses such as incomplete/co- dominance, multiple alleles, pleiotropy, epistasis, polygenetics, and lethal alleles.

Mendel and the Gene Idea (Ch 14)

- Terms associated with genetics problems: P, F_1, F_2, dominant, recessive, homozygous, heterozygous, phenotypic, and genotypic
- How to derive the proper gametes when working a genetics problem
- The difference between an allele and a gene
- How to read a pedigree

Concept 3: Applying the chromosomal basis of inheritance to analysis the effects of sex chromosomes, linked genes, and recombined recombines genes

The Chromosomal Bases of Inheritance (Ch 15)

- How the chromosome theory of inheritance connects the physical movement of chromosomes in meiosis to Mendel's laws of inheritance
- The unique pattern of inheritance in sex-linked genes

Lab 3: Mitosis and Meiosis

- The roles of segregation, independent assortment, and crossing over in generating genetic variation
- How to calculate map distance from experimental data

Lab 7: Genetics of Organisms

- How to use data to determine the mode of transmission and genetic make-up of the parents
- How to use a Punnett square to verify your conclusions

Concept 4: Applying the chromosomal basis of inheritance to analysis the effects of alterations in chromosome number or structure.

The Chromosomal Bases of Inheritance (Ch 15)

- How the chromosome theory of inheritance connects the physical movement of chromosomes in meiosis to Mendel's laws of inheritance
- How alteration of chromosome number or structurally altered chromosomes (deletions, duplications, etc.) can cause genetic disorders

Unit 4 – The Central Dogma (DNA Replication and Protein Synthesis)
Learning Goal: How does the genetic code work?

Concept 1: Analyzing the events of the cell cycle (Ch 12)

- The structure of the replicated chromosome.
- The stages of mitosis
- The regulation of the cell cycle with "checkpoints"
    - ❖ *Refer to pg 60-64 in Holtzclaw, Ch12 in Campbell and media resources*

Concept 2: Analyzing the processes of DNA Replication (Ch 16)

- The structure of DNA.
- The major steps to replication.
- The differences between replication, transcription, and translation.
- How DNA is packaged into a chromosomes.
    - ❖ *Refer to pg 117-122 in Holtzclaw, Ch 16 in Campbell and media resources*

Concept 3: Analyzing the structures of a cell (Ch 6)

- The differences between prokaryotic and eukaryotic cells.
- The structure and function of organelles common to plant and animal cells.
- The structure and functions of organelles found only in plant or only in animal cells.
    - ❖ *Refer to pg 43-48 in Holtzclaw, Ch 6 in Campbell and media resources*

Concept 4: Analyzing the processes of Protein Synthesis (Ch 17)

- The key terms gene expression, transcription, and translation
- How to explain the process of transcription
- How eukaryotic cells modify RNA after transcription
- The steps to translation
- How point mutations can change the amino acid sequence of a protein.
    - ❖ *Refer to pg 122-128 in Holtzclaw, Ch 17 in Campbell and media resources*

Unit 5 – The Evolutionary History of Biodiversity

Learning Goal: What are the evolutionary patterns across the spectrum of life?

Introduction: Analyzing the phylogenetic tree of life (Ch 26) ***This chapter is integrated throughout Concepts 1-4***

- The taxonomic categories and how they indicate relatedness.
- How systematic is used to develop phylogenetic trees.
- The tree domains of life including their similarities and differences
    - ❖ *Refer to pg 171-173 in Holtzclaw, Ch26 in Campbell and media resources*

Concept 1: Analyzing the diversity of animals (Ch 26, 32-34)

- The characteristics of animals.
- The stages of animal development.
- How to sort the animal phyla based on symmetry, development of a body cavity, and the fate of the blastopore .
    - ❖ *Refer to pg 186-190 in Holtzclaw, Ch 32 in Campbell and media resources*
- The traits that are used to divide the animals into groups: multicellular/single cellular, no true tissues/true tissues, radial symmetry/bilateral symmetry, protostomes/deuterostomes, acoelomate/pseudocoelomate/coelomate.
- Examples and unique traits for the following phyla: Porifera, Cnidaria, Platyhelminthes, Nematoda, Annelida, Arthropoda, Mollusca, Echinodermata, Chordata.
- The evolution of systems for gas exchange, respiration, excretion, circulation, and nervous control.
    - ❖ *Refer to pg 186-190 in Holtzclaw, Ch 32 in Campbell and media resources*
- The four chordate characteristics.
- The traits which distinguish the following classes: Chondrichthyes, Osteichthyes, Amphibia, Reptilia, Aves, Mammalia.
- Adaptations that allowed animals to move onto land.
- How the three classes of mammals differ in their reproduction.
    - ❖ *Refer to pg 186-190 in Holtzclaw, Ch 32 in Campbell and media resources*

Concept 2: Analyzing the diversity of bacteria, archaea, protists, and fungi (Ch 26, 27, 28, 31)

- The key ways in which prokaryotes differ from eukaryotes with respect to genome, membrane-bond organelles, size, and reproduction.
- Mechanisms that contribute to genetic diversity in prokaryotes, including transformation, conjugation, transduction, and mutation.
    - ❖ *Refer to pg 174-176 in Holtzclaw, Ch 27 in Campbell and media resources*
- An appreciation of the “real” kingdoms of protista.
- How chloroplasts and mitochondria evolved through endosymbiosis.
    - ❖ *Refer to pg 176-177 in Holtzclaw, Ch 28 in Campbell and media resources*

- The characteristics of fungi.
- Important ecological roles of fungi in mycorrhizal associations, and as decomposers and parasitic plant pathogens.
    - ❖ *Refer to pg 184-185 in Holtzclaw, Ch 31 in Campbell and media resources*

<u>Concept 3: Analyzing the diversity of plants (Ch 26, 29, 30)</u>

- Why land plants are thought to have evolved from green algae.
- Some of the disadvantages and advantages of life on land.
- That plants have a unique life cycle termed alteration of generations with a gametophyte generation and a sporophyte generation.
- The role of antheridia and archegonia in gametophtyes.
- The major characteristics of bryophytes.
- The major characteristics of seedless vascular plants.
    - ❖ *Refer to pg 178-181 in Holtzclaw, Ch 29 in Campbell and media resources*
- Key adaptations to life on land unique to seed plants.
- The evolutionary significance of seeds and pollen.
- The role of flowers and fruits in angiosperm reproduction.
- The role of stamens and carpels in angiosperm reproduction.
    - ❖ *Refer to pg 181-184 in Holtzclaw, Ch 30 in Campbell and media resources*

Themes of AP Biology:

- Science as a Process
- Evolution
- Energy Transfer
- Continuity and Change
- Relationship of Structure to Function
- Regulation
- Interdependence in Nature
- Science, Technology, and Society