**Bio 3 Exam 2 Study Guide**

Key words or terms from each lecture are new words introduced during the lecture that will likely be used in true or false, or multiple-choice questions. **Short answer free response questions will come from emboldened topics.** **Long answer free response questions will come from the emboldened and underlined topics**

**Intro to DNA and Genetics**

What is Deoxyribonucleic acid (DNA) and what is it made up of? What is a nucleotide and how is it different from a nitrogenous base? What are the four nitrogenous bases and which ones are always paired together? What is a gene? Know the difference between chromatin and chromosomes. How many chromosomes do humans have? Know the difference between haploid and diploid and which cells are haploid and which cells are diploid. What are gametes? What are somatic cells? What percentage of human DNA codes for proteins? Know the difference between mitosis and cytokinesis. Know the parts of a chromosome after DNA replication (sister chromatids, centromere). Know the enzymes involved in DNA replication and their function (helicase, DNA polymerase). Know how to create a complementary strand of DNA when given a template strand of DNA. Know what cells undergo meiosis and what cells undergo mitosis, and which ones are haploid and which ones are diploid. What are homologous chromosomes and what do two duplicated homologous chromosomes form (tetrad)? What separates during each meiosis division? **Be able to describe the differences between mitosis and meiosis concerning number of daughter cells, if the daughter cells are haploid or diploid, number of cell divisions, type of cells going through meiosis and mitosis, and whether or not genetic diversity is increased as a result of each process.** What separated during Meiosis I and what separates during Meiosis II? **Be able to describe the different sources of genetic variation (crossing over and independent assortment)**. Know the difference between traits, genes and alleles. Know the difference between an individual’s phenotype and genotype. What’s the difference between a dominant and recessive allele? When are dominant and recessive alleles expressed? Know the difference between homozygous and heterozygous genotypes, including homozygous dominant and homozygous recessive. What is the phenotypic ratio and genotypic ratio in a cross between two heterozygous individuals? Know how to use a punnet square. Mendel’s law of segregation. How many copies of each gene are within each gamete? Difference between discrete traits and qualitative traits. How are quantitative traits distributed within a population? Bell curve.

**Key words and terms**: Deoxyribonucleic acid, nucleotide, sugar-phosphate backbone, nitrogenous base, adenine, thymine, guanine, cytosine, gene, chromatin, histone, chromosome, genome, karyotype, haploid, gametes, diploid, somatic cells, mitosis, cytokinesis, template strand, complementary strand, sister chromatids, centromere, meiosis, somatic cells, gametes, haploid, diploid, homologous, tetrad, daughter cell, crossing over, independent assortment, genetics, heredity, trait, gene, allele, genotype, phenotype, dominant allele, recessive allele, homozygous, heterozygous, monohybrid cross, dihybrid cross, Law of segregation, discrete traits, quantitative traits, normal distribution, bell curve

**Intro to Evolution**

Know the difference between evolution (common descent with modification) and natural selection. **Be able to describe the difference between Lamarck’s theory of evolution through acquired traits and Darwin’s theory of evolution by means of natural selection using giraffes as an example.** Who was Alfred Russel Wallace and what idea did he arrive at independently? **Be able to describe Darwin’s four postulates of natural selection**. Know the different types of evidence for evolution. What is a transitional form? What is the difference between analogous and homologous structures? What is convergent evolution? **Be able to describe the evolution occurring in the guppies in the different ponds in John Endler’s experiments. Be sure to include the selective pressures acting driving the evolution of guppies in each pond.**

**Key words and terms:** Common decent, natural selection, binomial nomenclature, catastrophism, uniformitarianism,transitional forms, radiometric dating, morphology, homology, analogous structures, convergent evolution, vestigial traits, embryology,

**Fish Evolution Article**

**Be able to describe why there is such a great diversity of fish species in the lower Congo River. What factors are driving the evolution of fish in the lower Congo River and how does the presence of a colorless, blind fish help support scientist’s hypothesis to the evolution of fish in that river.**

**Means of Evolution**

What is genetic diversity and why is it important? Know the difference between macroevolution and microevolution. What is a population? **What are the five mechanisms of microevolutionary change? Be able to briefly describe each mechanism and be sure to state whether it is random or non-random with respect to fitness**. What is the primary way that new alleles are created? If a mutation occurs in a somatic cell is it likely to be passed on to the next generation? Are most mutations beneficial or deleterious? What is gene flow? What is genetic drift and when is it most pronounced? When does the founder effect occur? What is a genetic bottleneck? How can the loss of alleles bad for populations? Know the definition of biological fitness. What is an adaptation? Know the definition of natural selection. Is natural selection all about survival? What are selective pressures and how are they related to natural selection and adaptations? Know the different example of natural selection discussed in class including peppered moths, antibiotic resistance, disease resistance, Galapagos finches, and sickle cell anemia. What is coevolution and how is it different from convergent evolution? Know the examples of co-evolution including the cheetah and antelope, flower and pollinator, and newts and garter snake. What is sexual selection and what does it lead to? Sexual dimorphism. Do females always choose males with traits that are best for survival?

**Key words and terms**: Genetic diversity, adaptive potential, population, microevolution, macroevolution, mutation, deleterious mutation, geneflow, genetic drift, founder effect, genetic bottleneck, natural selection, biological fitness, adaptation, selective pressure, sexual selection, sexual dimorphism, coevolution

**Outcomes of Evolution**

What is a species? Biological species concept. What is reproductive isolation and why is it important in the definition of species? **Be able to describe the differences between macroevolution and microevolution**. Given enough time can microevolutionary changes lead to macroevolution (speciation)? **Be able to describe the steps required for the evolution of a new species (speciation). What are the two different types of speciation called? How does each type of speciation occur? Be able to provide an example of each type of speciation**. What is allopatric speciation? Be able to provide an example of allopatric speciation (frogs, gnatcatchers, terns, salamanders, finches). What is adaptive radiation and when does it commonly occur? How does sympatric speciation differ from allopatric speciation? What is an ecological niche? How do plants and animals evolve through sympatric speciation? Ecological niche (fish in lake) or polyploidy (plants). **What is an exaptation? Be able to provide an example of an exaptation. How do exaptaions differ from evolutionary novelties?** Is evolution goal oriented? Know the taxonomic order (Domain, Kingdom, Phylum, Class, Order, Family, Genus, Species) and which groups are like to contain closely related species (Species in the same genus are likely more closely related than species in the same order). What is the purpose of a phylogeny? Difference between ancestral trait and a derived trait. What is a synapomorphy and how are they displayed on a phylogeny? Be able to interpret a phylogeny and locate the last common ancestor between two groups.

**Key words and terms**: Biological species concept, reproductive isolation, macroevolution, microevolution, allopatric speciation, adaptive radiation, sympatric speciation, ecological niche, polyploidy, prezygotic barrier, post zygotic barrier, ecological isolation, temporal isolation, behavioral isolation, mechanical isolation, gametic isolation, zygote mortality, hybrid inviability, hybrid infertility, exaptation, anagenesis, cladogenesis, gradualism,