Science Learning Objectives

Genetics

Learning objective 1*a* Explain the difference between Darwin and Wallace and Lamarck.
Learning objective 1*b* Explain the importance of Darwin and Wallace's discoveries.

Learning objective 2*a* Compare and contrast come of the differences between types of speciation.
Learning objective 2*b* Describe the concept of adaptation.
Learning objective 2*c* Explain how speciation happens.

Learning objective 3*a* Explain the difference between genotype and phenotype.
Learning objective 3*b* Give some examples of phenotype.
Learning objective 3*c* Understand how genotype affects phenotype.

Learning objective 4*a* Explain some of the roles prokaryotes play.
Learning objective 4*b* List the parts of the prokaryotic cell.
Learning objective 4*c* Understand the classification system of living things and where prokaryotes fall within it.

Learning objective 5*a* Describe a semi-permeable membrane.
Learning objective 5*b* Describe some of the additional organelles present in the plant cell.

Learning objective 6*a* Describe the difference between binary fission and conjugation.
Learning objective 6*b* Describe the process of binary fission.
Learning objective 6*c* Describe the process of conjugation.

Learning objective 7*a* Describe how daughter cells are created via mitosis.
Learning objective 7*b* Diagram semi-conservative replication.
Learning objective 7*c* Understand DNA replication.

Learning objective 8*a* Describe the structure of chromosomes.
Learning objective 8*b* Explain what a karyotype is and how it can be used.
Learning objective 8*c* Understand the organizational relationship between DNA, genes, and chromosomes.

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Learning objective 9*a* Explain how DNA is purified and analyzed in the laboratory.
Learning objective 9*b* Explain how light can be used to measure yield and purity in a DNA sample.
Learning objective 9*c* Gain an understanding of how yield and purity are related.

Learning objective 10*a* Describe how genes are regulated.
Learning objective 10*b* Describe transcription.
Learning objective 10*c* Explain the chemistry of RNA.

Learning objective 11*a* Discuss how RNA is analyzed.
Learning objective 11*b* Discuss how RNA is purified.

Learning objective 12*a* Explain the chemistry of proteins.
Learning objective 12*b* Explain the function of proteins.

Learning objective 13 Describe the process of translation.

Learning objective 14*a* Describe how compounds can be screened as mutagens.
Learning objective 14*b* Explain how DNA mutations happen.
Learning objective 14*c* Understand the difference between somatic and germ line mutations.

Learning objective 15*a* Explain how DNA mutations are repaired.
Learning objective 15*b* Explain what happens if these mutations are not repaired.

Learning objective 16*a* Describe the difference between dominant and recessive.
Learning objective 16*b* Explain the important role of Gregor Mendel in our understanding of heredity.

Learning objective 17 Discuss probability and family trees.

Learning objective 18*a* Describe how probability is important for understanding genetics.
Learning objective 18*b* Describe the Forked Line method of understanding heredity.
Learning objective 18*c* Describe the Punnett Square method of understanding heredity.

Learning objective 19*a* Connect pedigrees to genetic inheritance.
Learning objective 19*b* Define and discuss the concept of pedigree.
Learning objective 19*c* Explain what pedigrees tell us.

Learning objective 20*a* Explain allelic variation.
Learning objective 20*b* Explain what an allele is.

Learning objective 21*a* Define dominance as it pertains to genetics.
Learning objective 21*b* Understand the concepts of co-dominance and incomplete dominance.

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Learning objective 22*a* Explain the role of mutations and describe recombination. **Learning objective 22*b*** Understand how crossing over happens. **Learning objective 22*c*** Understand how crossing over is important for genetic diversity.
Learning objective 23*a* Explain Hardy-Weinberg equilibrium. **Learning objective 23*b*** Understand how natural selection and genetic equilibrium are related.
Learning objective 24*a* Describe the concept of microevolution. **Learning objective 24*b*** Explain genetic drift.
Learning objective 25*a* Describe the difference between bacterial cloning and the creation of clones via nuclear transfer. **Learning objective 25*b*** Explain what DNA libraries are and why they are important.
Learning objective 26*a* Explain hybridization. **Learning objective 26*b*** Understand how these techniques allow scientists to study genetics.
Learning objective 27*a* Describe the process of PCR; denaturation, annealing and elongation. **Learning objective 27*b*** List the components of a PCR reaction. **Learning objective 27*c*** Understand the importance of genetic amplification.
Learning objective 28*a* Explain how DNA sequencing is achieved. **Learning objective 28*b*** Understand why DNA sequencing is important.
Learning objective 29*a* Explain how restriction enzymes are useful in the lab. **Learning objective 29*b*** Explain what a restriction enzyme is.
Learning objective 30*a* Describe mutagenesis and why it is used. **Learning objective 30*b*** Explain cassette based mutagenesis. **Learning objective 30*c*** Explain site-directed mutagenesis.
Learning objective 31 Define and describe metagenomics.
Learning objective 32 Explain how and why plants are genetically modified.
Learning objective 33 Explain how and why animals are genetically modified.
Learning objective 34 Discuss the role of genes in cancer.
Learning objective 35 Explain the influence of genes on behavior.
Learning objective 36 Define mitochondrial DNA and how it can be used in ancestry tracking.
Learning objective 37 Explain DNA fingerprinting and how it is used to establish genetic identity.
Learning objective 38 Describe pharmacogenomics and personalized medicine.

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Learning objective 39 Explain recombinant DNA and proteins.
Learning objective 40 Explain the concept of Evo-Devo in the study of genetics.
Learning objective 41 Define transgenic and explain why transgenic animals are important in research.
Learning objective 42*a* Describe the uses of the SNP Database. **Learning objective 42*b*** Explain the goals of the Human Genome Project.
Learning objective 43 Discuss genetic testing and disease diagnosis.
Learning objective 44 Describe genetic counseling and the ethical issues surrounding it.
Learning objective 45 Describe epigenetics and explain the importance of this concept.