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| Note: 1 period = 40 minutes |

Unit 1: Chemistry of Life
Summer assignment

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| **Number of periods** | **Activity number** | **Notes** | **Lab / Practical activity** | **Formative (BR or TOTD) or** **Summative Assessment** |
| 2 periods | 1 - 6 | Review: * Water and basic Biochemistry of cell
* Nucleotides & Nucleic acids
* Amino Acids & Protein structure hierarchy
 | none |  |
| 3 periods | 7 - 14 | Review: * Protein shapes and functions
* Carbohydrate chemistry
* Lipids & phospholipids
 | none |  |
| 1 period | 15 |  |  | Assessment Unit 1 |

Unit 2: Structure and Function

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| **Number of periods** | **Activity number** | **Notes** | **Lab / Practical activity** | **Formative (BR or TOTD) or** **Summative Assessment** |
| 4 periods | 16 - 21 | Vocab: transverse, longitudinal (sagittal) | Set up microscopes and sample slides for student practice | * Compare & contrast prokaryotes and eukaryotes.
* Compare & contrast plant and animal cells.
* Identify each organelle by image, drawing & function.
* Describe the structure of a mitochondria and a chloroplast
 |
| 4 periods | 22 - 28 |  | **Activity 24**:Investigation 4, Procedure 1 | * What is the relationship between cell size or shape and the rate of transport?
* How does the structure of the membrane support transport?
* Describe the structure of 3 different cell walls
 |
| 5 periods | 29 - 36 | Vocab: water potential (y), molarity (mol/L) | **Activity 30**:Investigation 4, Procedure 2**Activity 33**:Investigation 4, Procedure 3 | * In general, how does molecular size affect the rate of diffusion?
* Relate water potential to the rate of osmosis.
* Activity 33 Compare & contrast primary & secondary active transport.
* How does the membrane structure support cytosis?
 |
| 1 period | 37 - 38 |  |  | * How do compartments within cells improve the efficiency?
 |
| 1 period | 39 |  |  | Assessment Unit 2 |

Unit 3: Cellular Energetics

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| **Number of periods** | **Activity number** | **Notes** | **Lab / Practical activity** | **Formative (BR or TOTD) or** **Summative Assessment** |
| 3 periods | 40 - 44 | Vocab: active site, substrate, products, denaturation, specificityVocab: activation energy, transition state, catabolic, anabolic, exergonic, endergonicVocab: renaturation, pHVocab: reversible inhibitors, irreversible inhibitors, competitive inhibitors, non-competitive inhibitors, allosteric regulation, feedback inhibition |  | * What is the basic role of an enzyme?
* How do enzymes work?
* How can changes in pH or temperature alter the activity of an enzyme?
* Compare and contrast competitive and non-competitive inhibitors AND reversible and irreversible inhibitors.
 |
| 1 period | 45 |  | **Activity 45**:Investigation 13, Procedure 2 |  |
| 1 period | 46 – 47 | Vocab: cellular respiration, ATP, entropy, metabolic efficiency |  | * Why do living organisms NEED energy?
* How are photosynthesis & respiration connected?
 |
| 4 periods | 48 – 53  | Vocab: GOE (great oxygenation event), LDP (light dependent phase), LIP (light independent phase), RuBisCoVocab: pigments, absorption spectrum, action spectrum, non-cyclic phosphorylation, cyclic phosphorylation, Calvin cycle, limiting factor, hexose  | **Activity 53**:Investigation 5 | * What is the origin and fate of CO2, O2 and H2 in photosynthesis?
* Compare and contrast the absorption spectra and the action spectrum.
* Describe the events of photosynthesis, including the structures where these events occur.
* Activity 53
 |
| 3 periods | 54 – 59  | Vocabulary: glycolysis, link reaction, Krebs cycle, electron transport chain (ETC), oxidative phosphorylation, aerobic, anaerobic, lactic acid fermentation, alcoholic fermentation, chemiosmosis, ATP synthase | **Activity 58**:Investigation 6 | * Activity 58
* Why can’t alcoholic fermentation go on indefinitely?
 |
| 1 period | 60 | Vocab: hemoglobin, myoglobin, affinity, dissociation curve |  | Questions 6 - 8 |
| 1 period | 61 |  |  | Assessment Unit 3 |

Unit 4: Cell Communication and Cell Cycle

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| **Number of periods** | **Activity number** | **Notes** | **Lab / Practical activity** | **Formative (BR or TOTD) or** **Summative Assessment** |
| 2 periods | 62 – 64  | Vocab: ligand (biochemistry v chemistry def), receptors, gap junctions, plasmodesmaCompare & contrast nervous system and hormonal communication |  | * Compare and contrast the different types of signalling
* Compare & contrast short distance signalling in animals and plants
 |
| 1 period | 65 – 66  | Vocab: reception, transduction, response, cascades, phosphorylation |  | * What is the difference between molecules that require an external receptor and an internal receptor (extracellular v intracellular)?
 |
| 1 period | 67 – 68  | Vocab: quorum sensing, autoinducer |  |  |
| 1 period | 69 | Vocab: negative feedback, positive feedback |  | * Which type of feedback system maintains homeostasis?
 |
| 3 periods | 70 - 75 | Vocab: mitosis, meiosis, n, 2n, haploid, diploidVocab: cell cycle, G1, S, G2, M phase, cytokinesis, G0, mitotic indexReview chi-squared | **Activity 74**:Investigation 7, Part 1: Modeling Mitosis**Activity 75**:Investigation 7, Part 2: Environmental effects on mitosis |  |
| 2 periods | 76 - 78 | Vocab: MPF, kinase (CdK), cyclin,Proto-oncogenes, tumor-suppressor genes | **Activity 78**:Investigation 7, Part 3: Cell cycle control and cancer |  |
| 1 period | 79 |  |  | Assessment Unit 4 |

Unit 5: Heredity

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| **Number of periods** | **Activity number** | **Notes** | **Lab / Practical activity** | **Formative (BR or TOTD) or** **Summative Assessment** |
| 3 periods | 80 – 83  | Meiosis I and Meiosis IIVocab: crossing over, recombination, independent assortmentEvidence for a common ancestor | Paper crossing over outcome**Activity 81**:Investigation 7, Part 4 – Modeling Meiosis | Compare & contrast mitosis & meiosis |
| 3 periods | 84 - 88 | Vocab: traits, genes, genotype, phenotype, dominance, particulate inheritance, segregation, independent assortment,true-breeding, back cross, test cross, probabilityAnalyzing pedigrees and remembering recombination | Properly apply the product rule and the sum rule for calculating probabilitiesPractice pedigree notationInterpret prepared pedigrees | * Punnet Squares and offspring ratios
* Analyze a pedigree;
* Recognize an outcome altered by crossing over / recombination
 |
| 6 periods | 89 – 100  | Review calculating Chi-squaredNon-Mendelian Inheritance: codominance, incomplete dominance, lethal allelesHow does inheritance of linked genes look different from non-linked genes?Detecting linkageDescribe the different modes of sex determinationPolygenic inheritance | Distinguish between codominance & incomplete dominance**Activity** 96:Investigation 7, Part 5Using chi-squared to support or refute linkage explanations | * Use Chi-square to determine if crossing over has impacted the outcome of a cross
 |
| 3 periods | 101 – 105  | Non-nuclear inheritance (mitochondria & chloroplastsEnvironmental effect on phenotypeVocab: epigenetics, plasticitychromosomes and Mendel’s factorschromosomal inheritance: trinucleotide repeats, non-disjunctions |  |  |
| 1 period | 106 |  |  | Assessment Unit 5 |

Unit 6: Gene Expression and Regulation

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| **Number of periods** | **Activity number** | **Notes** | **Lab / Practical activity** | **Formative (BR or TOTD) or** **Summative Assessment** |
| 2 periods | 107 – 111  | Vocab: genome, gene, allele, nucleoid, plasmid exon, intron, | **Activity 111**:Create a DNA model | * Compare and contrast the prokaryotic and eukaryotic genome
* Describe the importance of DNA packaging
 |
| 1 period | 112 – 113  | Vocab: topoisomerase, helicase, polymerase, ligase, leading strand, lagging strand, Okazaki fragments |  | * Explain the semi-conservative nature of DNA replication
 |
| 3 periods | 114 - 117 | Vocab: expression, transcription, translation, Central Dogmaredundancy, degeneracy,RNAP. sense strand, antisense strand, intron, exon |  | * Describe information flow based on the Central Dogma
* Simulate a transcription and translation
 |
| 2 periods | 118 - 120 | Vocab: rRNA, small subunit, large subunit tRNA, initiation, elongation, terminationRetrovirus, reverse transcriptase, integrase |  | * How do the different RNAs work together?
 |
| 5 periods | 121 - 126 | Vocab: cellular differentiation, epigenetics,operon, gene induction, gene repressionPromoter region, TATA box, terminator sequence, transcription start, intron, exon, transcription factors, silencers, enhancersphenotype | Role play the gene regulation | * Distinguish between heterochromatin and euchromatin.
* Draw a diagram to show how galactose metabolism is regulated in yeast cells.
 |
| 1 period | 127 – 129  | vocab: microRNAs or miRNAs, mutations |  | * How are gametic and somatic mutations different?
 |
| 3 periods | 130 - 134 | Mutations in DNA and in chromosomesVocab: variation, natural selection, bacterial resistance, antigenic drift, antigenic shift | Describe each type of DNA mutation and its likely impact. | * How do chromosomal mutations occur? What is the likely outcome?
* What is HGT?
* Distinguish between antigenic drift and antigenic shift.
 |
| 6 periods | 135 - 145 | Vocab: genetic engineering, endonucleases, CRISPR-Cas9, gel electrophoresis,amplification, PCR, gene cloning, sticky ends, aseptic technique, transformationDNA sequencing, DNA fingerprinting (profiling), short tandem repeats (STRs)Restriction fragment length polymorphisms (RFLPs), genetic modification, bioinformaticsStreak plating vs replica plating aseptic technique, | **Activity 139**:Investigation 8: Bacterial transformation**Activity 140**:Investigation 8: Bacterial transformation**Activity 143**:Investigation 9: Restriction enzyme analysis of DNA | **Activity 142**:Question 4 – Paternity test with explanation |
| 1 period | 146 |  |  | Assessment Unit 6 |

Unit 7: Natural Selection

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| **DurationNumber of periods** | **Activity number** | **Notes** | **Lab / Practical activity** | **Formative (BR or TOTD) or** **Summative Assessment** |
| 1 period | 147, 148 | Define evolution | To what specific factor can you attribute the change in the ladybug population? (p265) | * What are the 4 factors that drive evolution?
 |
| 2 periods | 149 - 153 | Vocab: absolute fitness, relative fitness, abundance, frequency,  |  | * Distinguish between absolute and relative fitness.
* What does the Hardy-Weinberg equation calculate?
 |
| 4 periods | 154 - 158 | Vocab: artificial selection, selective breeding, hybrid vigor, evolutionary convergence, analogous structures | **Activity 157**:Investigation 1: Artificial selection. | * Describe various selection pressures and the likely outcomes of those pressures.
 |
| 4 periods | 159 - 163 | Vocab: mutation, gene flow, natural selection, genetic drift, genetic equilibrium, population bottleneck, founder effect |  |  |
| 2 periods | 164 - 165 |  | **Activity 165**:Investigation 2: Mathematical Modelling | * Use the Hardy-Weinberg equation to calculate allelic frequencies.
 |
| 8 periods | 166 - 176 | Vocab: homologous structures, vestigial structures, evo-devo | **Activity 174**:Simulate relative datingInterpret phylogeny based on highly conserved proteins | * Compare and contrast radiometric and relative dating methods.
 |
| 1 period | 177 - 178 | Vocab: domain, endosymbiotic theory |  | * What distinguishes the 3 domains of life?
 |
| 4 periods | 179 - 183 | Vocab: transitional fossils, antibiotic resistance, epidemic, pandemic |  |  |
| 4 periods | 184 - 188 | Vocab: taxon (taxa), phylogenetic tree, cladistics, derived characteristics, rule of parsimony |  | * Construct and analyze phylogenetic trees.
* Construct a cladogram
 |
| 9 periods | 189 - 197 | Vocab: species, divergent evolution, convergent evolution, parallel evolution, coevolution, punctuated equilibrium, phyletic gradualism, adaptive radiation, allopatric evolution, sympatric speciation |  | * What is a species?
* Compare and contrast the different patterns of evolution.
 |
| 2 periods | 198 - 200 | Vocab: background extinction, mass extinction |  |  |
| 2 periods | 201 - 202 | Vocab: genetic diversity, bioinformatics | **Activity 202**:Investigation 3: Comparing DNA sequences |  |
| 2 periods | 203 - 206 | Vocab: protobiont, liposome, RNA world, ribozyme |  |  |
| 1 period | 207 |  |  | Assessment Unit 7 |

Unit 8: Ecology

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| **Number of periods** | **Activity number** | **Notes** | **Lab / Practical activity** | **Formative (BR or TOTD) or** **Summative Assessment** |
| 3 periods | 208 - 212 | Vocab: behavior, adaptive behavior, innate, phytohormones, tropisms, apical dominance, photoperiodism, phytochrome |  | * How are plant adaptive “behaviors” expressed?
* How can these be modified or exploited?
 |
| 1 period | 213 | Vocab: transpiration | **Activity 213**:Investigation 11: Transpiration |  |
| 1 period | 214 – 215 | Vocab: kineses, taxes |  | * Data interpretation
 |
| 1 period | 216 |  | **Activity 216**:Investigation 12: Fruit fly behavior |  |
| 1 period | 217 - 219 | Vocab: stimulus, response, nastic responses, pheromones |  | * Relate communication and responses (behaviors) to fitness.
 |
| 1 period | 220 – 221 | Vocab: courtship, lekking,  |  | * Relate courtship behaviors to breeding success.
 |
| 4 periods | 222 - 228 | Vocab: herd, flock, school, cooperative behavior, altruism, eusocial colonies, kin selection |  | * What are some of the benefits of cooperation? Explain each
 |
| 6 periods | 229 - 235 | Vocab: endothermy, ectothermy,Reproductive investment, metabolism vs body size, food chain, food web, trophic level, apex predator, autotroph, heterotroph |  | * Is energy allocation a fixed ratio in all organisms? Explain
* Compare and contrast endothermy and ectothermy.
 |
| 2 periods | 236 | Vocab: production, productivity | **Activity 236**:Investigation 10: Energy dynamics |  |
| 2 periods | 237 - 238 | Vocab: population dynamics, limiting factors, biotic potential, natality, mortality, exponential growth,  |  | * Does exponential growth ever occur? Is it sustainable? Explain
 |
| 1 period | 239 | Vocab: logistic growth, carrying capacity, r and K selection |  | * Describe logistic growth. How is it related to exponential growth?
 |
| 2 periods | 240 – 242 | Vocab: diversity index, indicator species, ecological succession, primary succession, secondary succession, pioneer organisms | Calculate diversity indicesEstablish difference in clover growth relative to grazing regime. | * Compare and contrast the various types of species relationships.
 |
| 2 periods | 243 – 244 | Vocab: resistance, resilience, stability, keystone species |  | * Describe the relationship between an ecosystem’s diversity and its stability or resilience.
 |
| 2 periods | 245 – 248 | Vocab: invasive species, habitat fragmentation |  |  |
| 1 period | 249 |  |  | Assessment Unit 8 |

Sciences Practice Chapter

This chapter provides skills support for the six skills listed and integrated throughout AP Biology. There is no prescribed time to utilize these activities, use your discretion to assign these activities when you feel they will be best utilized. Integration of these activities will help support students gain confidence in the application of the science practices.

Total = 161 class periods