
10th Grade Biology K

Curriculum Guide

Scranton School District

Scranton, PA



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Curriculum Guide

10th Grade Biology K

Prerequisite:

- Successful completion of General Science

This course is designed to prepare students for proficient and advanced scoring on the Keystone Biology Exam.

**Scranton School District
Curriculum Guide**

Year-at-a-glance

Subject: 10th Grade Biology K	Grade 10	Date Completed: 8/7/15
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1st Quarter

Topic	Resources	Assessment Anchors
Introduction to Biology	Approved textbook SAS resources Suggested: Keystone Finish Line Biology Unit 1	BIO.A.1.1.1 BIO.A.1.2.1 BIO.A.1.2.2 CC.1.2 CC.1.4 CC.1.5 CC.2.1 CC.2.2 CC.2.4
Chemical Basis for Life	Approved textbook SAS resources Suggested: Keystone Finish Line Biology Unit 2	BIO.A.2.1.1 BIO.A.2.2.1 BIO.A.2.2.2 BIO.A.2.2.3 BIO.A.2.3.1 BIO.A.2.3.2 CC.1.2 CC.1.4 CC.1.5 CC.2.1 CC.2.2 CC.2.4
Bioenergetics	Approved textbook SAS resources Suggested: Keystone Finish Line Biology Unit 3	BIO.A.3.1.1. BIO.A.3.2.1 BIO.A.3.2.2 CC.1.2 CC.1.4 CC.1.5 CC.2.1 CC.2.2 CC.2.4

**Scranton School District
Curriculum Guide**

Homeostasis and Transport	Approved textbook SAS resources Suggested: Keystone Finish Line Biology Unit 4	BIO.A.4.1.1 BIO.A.4.1.2 BIO.A.4.1.3 BIO.A.4.2.1 CC.1.2 CC.1.4 CC.1.5 CC.2.1 CC.2.2 CC.2.4
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**Scranton School District
Curriculum Guide**

2nd Quarter

Topic	Resources	Assessment Anchors
Cell Growth and Reproduction	Approved textbook SAS resources Suggested: Keystone Finish Line Biology Unit 5	BIO.B.1.1.1 BIO.B.1.1.2 BIO.B.1.2.1 BIO.B.1.2.2 BIO.B.2.2.1 BIO.B.2.2.2 CC.1.2 CC.1.4 CC.1.5 CC.2.1 CC.2.2 CC.2.4
Genetics	Approved textbook SAS resources Suggested: Keystone Finish Line Biology Unit 6	BIO.B.1.2.2 BIO.B.2.1.1 BIO.B.2.1.2 BIO.B.2.3.1 BIO.B.3.1.3 BIO.B.2.4.1 CC.1.2 CC.1.4 CC.1.5 CC.2.1 CC.2.2 CC.2.4

**Scranton School District
Curriculum Guide**

3rd Quarter

Topic	Resources	Assessment Anchors
Genetics (continued)		
Evolution	Approved textbook SAS resources Suggested: Keystone Finish Line Biology Unit 7	BIO.B.3.1.1 BIO.B.3.1.2 BIO.B.3.1.3 BIO.B.3.2.1 BIO.B.3.3.1 CC.1.2 CC.1.4 CC.1.5 CC.2.1 CC.2.2 CC.2.4

**Scranton School District
Curriculum Guide**

4th Quarter

Topic	Resources	Assessment Anchors
Ecology	Approved textbook SAS resources Suggested: Keystone Finish Line Biology Unit 8	BIO.B.4.1.1 BIO.B.4.1.2 BIO.B.4.2.1 BIO.B.4.2.2 BIO.B.4.2.3 BIO.B.4.2.4 BIO.B.4.2.5 CC.1.2 CC.1.4 CC.1.5 CC.2.1 CC.2.2 CC.2.4
Keystone Review	Approved textbook SAS resources Suggested: Keystone Finish Line Biology	
Survey of the Animal Kingdom (optional study)	Approved textbook SAS resources	
Final Exam Review	Approved textbook SAS resources Suggested: Keystone Finish Line Biology	

**Scranton School District
Curriculum Guide**

General Topic	Academic Standard(s)	Essential Knowledge, Skills & Vocabulary	Resources & Activities	Assessments	Suggested Time
Introduction to Biology	BIO.A.1.1.1 BIO.A.1.2.1 BIO.A.1.2.2	<ul style="list-style-type: none"> • Review scientific processes and methods • Common characteristics of life: <ul style="list-style-type: none"> ○ composed of one or more units called cells ○ obtain and use matter and energy to carry out their life processes ○ reproduce and pass their genetic material on to the next generation ○ seek to maintain a biological balance between their internal and external environments ○ grow, develop and eventually die ○ detect and respond to stimuli ○ adapt and evolve at the population level • Similarities and differences in structure between prokaryotic and eukaryotic cells • Relationship between form and function • Common features/functions of cell structures in both prokaryotic and eukaryotic cells • Levels of biological organization from organelle to multicellular organism <ul style="list-style-type: none"> ○ Organelle ○ Cell ○ Tissue ○ Organ ○ Organ System ○ Multicellular Organism <p>Relationship between form and function</p> <p>Keystone Eligible vocabulary:</p> <ul style="list-style-type: none"> • prokaryotic cell • eukaryotic cell 	Approved textbook SAS resources Suggested: Keystone Finish Line Biology Unit 1	Teacher prepared tests, quizzes, etc.	5 days

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Curriculum Guide**

		<ul style="list-style-type: none"> • stimuli • adapt • evolve • population • organelle • cell • tissue • organ • organ system • multicellular organism 			
Chemical Basis for Life	BIO.A.2.1.1 BIO.A.2.2.1 BIO.A.2.2.2 BIO.A.2.2.3 BIO.A.2.3.1 BIO.A.2.3.2	<ul style="list-style-type: none"> • Chemical structure of water • Polarity of Water/Hydrogen Bonding <ul style="list-style-type: none"> ○ Adhesion and Cohesion <ul style="list-style-type: none"> ▪ Surface Tension ▪ Capillary action ○ High Specific Heat ○ Universal Solvent ○ Density anomaly • Examples of how the properties of water support life <ul style="list-style-type: none"> ○ Temperature moderation ○ Solid water less dense than liquid water ○ Water cycle ○ Metabolism requires an aqueous environment ○ Transpiration ○ Buffering properties of water • Levels of biochemical organization (atoms, molecules, macromolecules) • Chemical properties of Carbon atoms <ul style="list-style-type: none"> ○ Form 4 covalent bonds • Structural shapes of carbon molecules (straight chains, branched chains, rings) 	Approved textbook SAS resources Suggested: Keystone Finish Line Biology Unit 2		15 days

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Curriculum Guide**

	<ul style="list-style-type: none"> • Monomers vs. Polymers • Monomer that forms carbohydrates, proteins and nucleic acids (monosaccharide, amino acid, nucleotide) <ul style="list-style-type: none"> ○ Idea of no common monomer for lipids • Dehydration Synthesis (Condensation) and Hydrolysis reactions • Basic structure of the four major classes of biological macromolecules <ul style="list-style-type: none"> ○ Common Chemical Components ○ Examples of monomers from each class ○ Examples of polymers constructed of the monomers • Importance and use of each macromolecule for biological functions • Enzymes as proteins • Enzyme and substrate specificity/interactions <ul style="list-style-type: none"> ○ Lock and key model • Effect of enzymes on activation energy and reaction rates • Reusable nature of enzymes • Examples of enzyme controlled reactions in living things • Enzyme activity as a function of specific conditions <p>Effects of environmental factors (pH, temperature, concentration) on enzyme function</p> <p>Keystone Eligible vocabulary:</p> <ul style="list-style-type: none"> • polarity • hydrogen bond • adhesion • cohesion • surface tension • capillary action 			
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		<ul style="list-style-type: none"> • high specific heat • universal solvent • density anomaly • macromolecule • monomer • polymer • dehydration synthesis (condensation) • hydrolysis • monosaccharide • amino acid • nucleotide • carbohydrates • lipids • proteins • nucleic acids • enzyme • catalyst • substrate • activation energy • active site • reaction rates • pH • concentration 			
Bioenergetics	BIO.A.3.1.1. BIO.A.3.2.1 BIO.A.3.2.2	<ul style="list-style-type: none"> • Double membrane structure of mitochondria • Double membrane structure of chloroplasts • Roles of mitochondria and chloroplasts in energy transformations • catabolic vs. anabolic chemical reactions • Overall (summary) chemical equations for photosynthesis and cellular respiration 	Approved textbook SAS resources Suggested: Keystone Finish Line Biology Unit 3		10 days

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		<ul style="list-style-type: none"> • Basic energy transformations during photosynthesis and cellular respiration • Relationship between photosynthesis and cellular respiration • Molecular structure of ATP • ATP-ADP Cycle <p>Importance of ATP as the energy currency (fuel) for cell processes</p> <p>Keystone Eligible vocabulary:</p> <ul style="list-style-type: none"> • mitochondria • plastids • chloroplasts • photosynthesis • cellular respiration • metabolism • anabolic reaction • catabolic reaction • chemical energy • adenosine triphosphate (ATP) • adenosine diphosphate (ADP) 			
Homeostasis and Transport	Bio.A.4.1.1 Bio.A.4.1.2 Bio.A.4.1.3 Bio.A.4.2.1	<ul style="list-style-type: none"> • Chemical structure of the plasma membrane (Phospholipid Bilayer) • Fluid mosaic model • Functions of the plasma membrane • Passive transport mechanisms <ul style="list-style-type: none"> ○ Diffusion ○ Osmosis 	Approved textbook SAS resources Suggested: Keystone Finish Line Biology Unit 4		15 days

**Scranton School District
Curriculum Guide**

		<ul style="list-style-type: none"> ○ Facilitated Diffusion * Active transport mechanisms <ul style="list-style-type: none"> ○ Pumps ○ Endocytosis ○ Exocytosis ● Endoplasmic Reticulum <ul style="list-style-type: none"> ○ Rough ER <ul style="list-style-type: none"> ▪ Synthesis/transport of proteins ○ Smooth ER <ul style="list-style-type: none"> ▪ Synthesis/transport of lipids ▪ Synthesis/transport of carbohydrates ● Golgi Apparatus ● Processes and packages for intra and extra-cellular transport ● Examples of Mechanisms <ul style="list-style-type: none"> ○ Thermoregulation ○ Water regulation ○ Oxygen regulation ○ Chemical regulation <ul style="list-style-type: none"> ▪ pH/Buffers ▪ Hormone ▪ Electrolyte <p>Keystone Eligible vocabulary:</p> <ul style="list-style-type: none"> ● phospholipids bilayer ● fluid mosaic model ● selectively permeable ● passive transport ● diffusion ● osmosis ● facilitated diffusion ● active transport ● pumps ● endocytosis 			
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**Scranton School District
Curriculum Guide**

		<ul style="list-style-type: none"> • exocytosis • homeostasis • intracellular transport • endoplasmic reticulum • Golgi apparatus • vesicles • buffers • electrolyte • thermoregulation 			
Cell Growth and Reproduction	BIO.B.1.1.1 BIO.B.1.1.2 BIO.B.1.2.1 BIO.B.1.2.2 BIO.B.2.2.1 BIO.B.2.2.2	<ul style="list-style-type: none"> • Stages of the cell cycle <ul style="list-style-type: none"> ○ Interphase <ul style="list-style-type: none"> ▪ G1 ▪ S ▪ G2 ○ Nuclear Division <ul style="list-style-type: none"> ▪ Mitosis ▪ Meiosis ○ Cytokinesis <ul style="list-style-type: none"> ▪ Plant vs. Animal Cell • Phases of Mitosis • Phases of Meiosis • Importance of Mitosis and Meiosis • Outcomes of Mitosis and Meiosis • Importance of chromosome composition and number controlling phenotype <p>Chromosomal Mutations during Mitosis and Meiosis</p> <p>Keystone Eligible vocabulary:</p> <ul style="list-style-type: none"> • cell cycle • interphase • mitosis • meiosis 	Approved textbook SAS resources Suggested: Keystone Finish Line Biology Unit 5		15 days

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Curriculum Guide**

		<ul style="list-style-type: none"> • cytokinesis • cell plate • cleavage furrows • prophase • metaphase • anaphase • telophase • haploid • diploid • chromosome • chromatid • homologous chromosomes • tetrad • crossing over • spindle (fiber) • somatic cells • germ cells • gametes • independent assortment • chromosomal mutation • nondisjunction • duplication • translocation • deletion • insertion • inversion 			
Genetics: Gene to protein and Nucleic Acids	BIO.B.1.2.2 BIO.B.2.1.1	<ul style="list-style-type: none"> • Structure of DNA <ul style="list-style-type: none"> ○ Components of a Nucleotide ○ Base-pair rule (Chargaff's Rule) • Semi-conservative/DNA Replication Process • Structure of eukaryotic chromosomes • Similarities and differences between DNA and RNA 	Approved textbook SAS resources Suggested: Keystone Finish Line Biology Unit 6		15 days

**Scranton School District
Curriculum Guide**

<p>Genetics: Patterns of Inheritance</p>	<p>BIO.B.2.1.2 BIO.B.2.3.1 BIO.B.3.1.3</p>	<ul style="list-style-type: none"> • Types of RNA • Transcription uses DNA to make RNA • Translation uses RNA to make a protein • Location of transcription in eukaryotic cells (nucleus) • Location of translation (ribosomes) • Role of ribosomes, endoplasmic reticulum and Golgi apparatus in assembling, transporting, packaging and modifying different proteins • Phenotype as a function of gene expression (DNA to protein to phenotype) • Mutations may or may not affect phenotype • Different types of gene mutations • Common Patterns of Inheritance • Tools for predicting patterns of inheritance <ul style="list-style-type: none"> ○ Punnett square ○ Pedigree ○ Mathematics of probability • Relationship between genotype and phenotype • Tools of genetic engineering • Examples of genetic engineering <ul style="list-style-type: none"> ○ Genetically modified organisms in medicine and agriculture ○ Use of biotechnology in forensics, medicine, and agriculture ○ Cloning ○ Selective Breeding ○ Gene splicing ○ Gene Therapy 			<p style="text-align: center;">20 days</p>
<p>Genetics: Biotechnology</p>	<p>BIO.B.2.4.1</p>	<p>Keystone Eligible vocabulary:</p> <ul style="list-style-type: none"> • deoxyribonucleic acid (DNA) • DNA Replication • double helix 			<p style="text-align: center;">5 days</p>

Scranton School District
Curriculum Guide

		<ul style="list-style-type: none">• nucleotide• deoxyribose• adenine• guanine• cytosine• thymine• Chargaff's Rule• parent strand• complimentary strand• semi-conservative model• genes• chromosomes• transcription• translation• ribonucleic acid• ribosomes• nucleus• amino acids• polypeptides• enzymes• proteins• triplet• codon• anticodon• endoplasmic reticulum• Golgi apparatus• gene Mutation• insertion• deletion• frameshift mutation• point mutation• silent• missense			
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**Scranton School District
Curriculum Guide**

		<ul style="list-style-type: none"> • nonsense • dominant • recessive • codominance • incomplete dominance • sex-linked • polygenic • multiple alleles • genetics • Punnett square • pedigree • genotype • phenotype • probability • homozygous • heterozygous • genetic engineering • genetically modified organisms • biotechnology • cloning • selective breeding • gene splicing • gene therapy 			
Midterm Review			Approved textbook SAS resources Suggested: Keystone Finish Line Biology Units 1-6		5 days
Evolution	BIO.B.3.1.1 BIO.B.3.1.2 BIO.B.3.1.3 BIO.B.3.2.1	<ul style="list-style-type: none"> • Principles of Inheritance • Fundamental Principles of Natural Selection • Types of Natural Selection <ul style="list-style-type: none"> ○ Directional 	Approved textbook SAS resources Suggested: Keystone Finish Line Biology		20 days

**Scranton School District
Curriculum Guide**

	BIO.B.3.3.1	<ul style="list-style-type: none"> ○ Stabilizing ○ Diversifying/Disruptive ● Factors that contribute to speciation <ul style="list-style-type: none"> ○ Isolating mechanisms ○ Genetic drift ○ Founder effect ● Migration ● Genotype and Phenotype ● Types of Genetic Mutations ● Examples of variation in populations ● Evidences of Evolution <ul style="list-style-type: none"> ○ Fossil ○ Anatomical ○ Physiological ○ Embryological ○ Biochemical ○ Universal Genetic Code ● Scientific terms <ul style="list-style-type: none"> ○ Hypothesis and Prediction ○ Inference and Observation ○ Principle ○ Theory ○ Law ○ Fact and Opinion ● Classification <ul style="list-style-type: none"> ○ Taxonomy and nomenclature ○ Kingdoms <p>Keystone Eligible vocabulary:</p> <ul style="list-style-type: none"> ● populations ● natural selection ● allele frequency ● species ● fitness 	Unit 7		
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Scranton School District
Curriculum Guide

		<ul style="list-style-type: none">• adaptation• variation• directional selection• stabilizing selection• diversifying/ disruptive selection• speciation• isolating mechanisms• genetic drift• founder effect• migration• genotype• phenotype• mutation• variation• evolution• fossil• fossil record• anatomical• physiological• embryological• biochemical• universal genetic code• homologous structures• analogous structures• vestigial structures• convergent evolution• divergent evolution• hypothesis• prediction• inference• observation• principle• theory• law• fact• opinion			
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**Scranton School District
Curriculum Guide**

Ecology	BIO.B.4.1.1 BIO.B.4.1.2 BIO.B.4.2.1 BIO.B.4.2.2 BIO.B.4.2.3 BIO.B.4.2.4 BIO.B.4.2.5	<ul style="list-style-type: none"> • The levels of ecological organization <ul style="list-style-type: none"> ○ Organism ○ Population ○ Community ○ Ecosystem ○ Biome ○ Biosphere • Abiotic components of an ecosystem • Biotic components of an ecosystem • Characteristic abiotic and biotic components of earth’s aquatic and terrestrial ecosystems. • The ultimate energy source is the sun. <ul style="list-style-type: none"> ○ Other initial sources of energy <ul style="list-style-type: none"> ▪ Chemicals ▪ Heat • Photosynthesis and Cellular Respiration • Structure and components of a food chain or food web. • Implications of the 10% rule/law (energy pyramids) • Habitat and niche (fundamental and realized) • Symbiotic interactions within an ecosystem • Symbiotic interactions within an ecosystem ▪ Biogeochemical cycles <ul style="list-style-type: none"> ○ Water cycle ○ Carbon cycle ○ Oxygen cycle ○ Nitrogen cycle • Examples of Natural Disturbances Affecting Ecosystems <ul style="list-style-type: none"> ○ Ecological Succession ○ Natural Disasters • Examples of Human Disturbances Affecting Ecosystems <ul style="list-style-type: none"> ○ Human overpopulation ○ Climate changes ○ Introduction of nonnative species 	Approved textbook SAS resources Suggested: Keystone Finish Line Biology Unit 8		15 days
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**Scranton School District
Curriculum Guide**

		<ul style="list-style-type: none"> ○ Pollution ○ Fires ● Effects of Human and Natural Disturbances on Ecosystems <ul style="list-style-type: none"> ○ Loss of biodiversity ○ Loss of habitat ○ Increased rate of Extinction ○ Disruption of natural biological cycles ● Carrying Capacity ● Limiting Factors <ul style="list-style-type: none"> ○ Density Dependent ○ Density Independent ● Effects of limiting factors on population dynamics <ul style="list-style-type: none"> ○ Biotic Potential ○ Environmental Resistance ○ Increase/Decreased/ Stabilized Population Growth ○ Extinction ○ Increased/decreased/stabilized biodiversity <p>Keystone Eligible vocabulary:</p> <ul style="list-style-type: none"> ● organism ● population ● community ● ecosystem ● biome ● biosphere ● biotic ● abiotic ● aquatic ecosystem ● terrestrial ecosystem ● energy ● autotroph 			
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Scranton School District
Curriculum Guide

		<ul style="list-style-type: none">• heterotroph• trophic level• food chain• food web• producer• consumer• omnivore• decomposer• herbivore• carnivore• ecological pyramid• 10% rule/law• photosynthesis• chemosynthesis• competition• predation• symbiosis• parasitism• commensalism• mutualism• fundamental niche• realized niche• water cycle• carbon cycle• oxygen cycle• nitrogen cycle• succession• extinction• evolution• biodiversity• nonnative species• carrying capacity• limiting factors			
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**Scranton School District
Curriculum Guide**

		<ul style="list-style-type: none"> • density dependent • density independent • extinction • biotic potential • biodiversity 			
Keystone Review			Approved textbook SAS resources Suggested: Keystone Finish Line Biology		10 days
Survey of the Animal Kingdom (optional study)			Approved textbook SAS resources		15 days
Final Exam and Review			Approved textbook SAS resources Suggested: Keystone Finish Line Biology		15 days