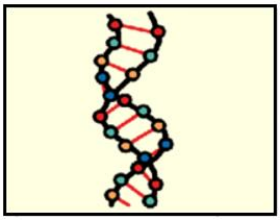
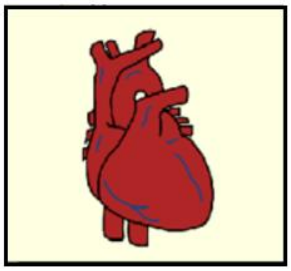
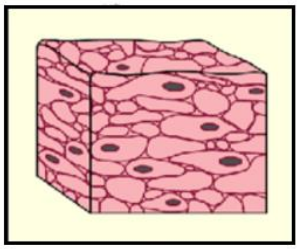
Reporting Category	Using Models to Describe and Explain Structure, Function, and Processes
Content Connector	**B.1.1.a.1:** Compare and contrast the shape and function of the essential biological macromolecules (i.e., carbohydrates, lipids, proteins, and nucleic acids).
IAS Standard	**B.1.1:** Compare and contrast the shape and function of the essential biological macromolecules (i.e. carbohydrates, lipids, proteins, and nucleic acids), as well as, how chemical elements (i.e. carbon, hydrogen, oxygen, nitrogen, phosphorus, and sulfur) can combine to form these biomolecules.
Content Limits	Tier 1 and 2 items should avoid the word “best” in the stem. Any necessary stimulus should be written with clear language following the rules for “plain language.” Any necessary stimulus text complexity should increase as the tiers increase. Tier 1 items should contain picture support in answer choices when possible to aid comprehension. Tier 2 items can contain picture support in answer choices. Tier 3 items should not contain picture support unless necessary. Tier 1 distractors should demonstrate clear misunderstanding of the concept or skill. Tier 2 distractors should be possible misunderstandings of the concept or skill. Limit to the basic four macromolecules: carbohydrates, lipids, proteins, and nucleic acids.
Allowable Stimulus Material	graphics; diagrams; charts
Context	No context required
Recommended Response Mechanisms	Multiple Choice (MC) Multiple Select (MS) Table Match (TM)
Construct-Relevant Vocabulary	carbohydrate, lipid, protein, nucleic acid, macromolecule, biological, function, structure (shape)
Cognitive Complexity	3

Evidence Statements	
Evidence Statements	**Tier 1** Students can identify a macromolecule.
	Tier 2 Students can identify the function of a macromolecule.
	Tier 3 Students can identify or sort macromolecules based on their functions.
Accessibility and Accommodation Considerations	
Stimulus Graphic Limitations	Stimulus graphics will be limited to clear photos, illustrations, diagrams, tables, and charts that directly relate to the passage topic. Information contained within stimulus graphics is ineligible for assessment unless specifically prescribed by Content Connector and/or evidence statements.
Linguistic Complexity	To be determined after IDOE review
Reference Tools	N/A

Sample Item	
Tier 1	Which is made entirely of macromolecules? A.  DNA **(audio: DNA)** B.  heart (audio: the heart) C.  tissue (audio: a tissue)

Reporting Category	Using Models to Describe and Explain Structure, Function, and Processes
Content Connector	**B.1.1.a.2:** Describe how chemical elements (i.e., carbon, hydrogen, oxygen, nitrogen, phosphorus, and sulfur) can combine to form biomolecules (i.e., carbohydrates, lipids, proteins, and nucleic acids).
IAS Standard	**B.1.1:** Compare and contrast the shape and function of the essential biological macromolecules (i.e. carbohydrates, lipids, proteins, and nucleic acids), as well as, how chemical elements (i.e. carbon, hydrogen, oxygen, nitrogen, phosphorus, and sulfur) can combine to form these biomolecules.
Content Limits	Tier 1 and 2 items should avoid the word “best” in the stem. Any necessary stimulus should be written with clear language following the rules for “plain language.” Any necessary stimulus text complexity should increase as the tiers increase. Tier 1 items should contain picture support in answer choices when possible to aid comprehension. Tier 2 items can contain picture support in answer choices. Tier 3 items should not contain picture support unless necessary. Tier 1 distractors should demonstrate clear misunderstanding of the concept or skill. Tier 2 distractors should be possible misunderstandings of the concept or skill. Limit to elements in standard: carbon, hydrogen, oxygen, nitrogen, phosphorus, and sulfur. Limit to the basic four macromolecules: carbohydrates, lipids, proteins, and nucleic acids.
Allowable Stimulus Material	graphics of elements and/or macromolecules
Context	No context required
Recommended Response Mechanisms	Multiple Choice (MC) Multiple Select (MS) Table Match (TM)
Construct-Relevant Vocabulary	element (of the Periodic Table), carbon, hydrogen, oxygen, nitrogen, phosphorus, sulfur, carbohydrate, lipid, protein, nucleic acid
Cognitive Complexity	3

Evidence Statements	
Evidence Statements	**Tier 1** Students can identify a chemical element by name or symbol.
	Tier 2 Students can identify that macromolecules are made of specific chemical elements.
	Tier 3 Students can identify which elements make up each type of macromolecule.
Accessibility and Accommodation Considerations	
Stimulus Graphic Limitations	Stimulus graphics will be limited to clear photos, illustrations, diagrams, tables, and charts that directly relate to the passage topic. Information contained within stimulus graphics is ineligible for assessment unless specifically prescribed by Content Connector and/or evidence statements.
Linguistic Complexity	To be determined after IDOE review
Reference Tools	N/A

Sample Item	
Tier 2	The chemical formula for sugar is $C_{12}H_{22}O_{11}$. Which element is used to make sugar? **A. carbon** B. nitrogen C. sulfur

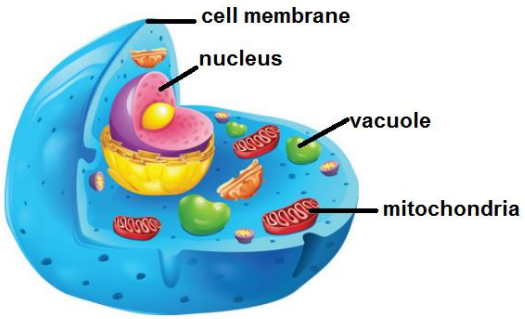
Reporting Category	Using Models to Describe and Explain Structure, Function, and Processes
Content Connector	**B.1.3.a.1:** Refer to a model to explain how a cell membrane functions.
IAS Standard	**B.1.3:** Develop and use models that illustrate how a cell membrane regulates the uptake of materials essential for growth and survival while removing or preventing harmful waste materials from accumulating through the processes of active and passive transport.
Content Limits	Tier 1 and 2 items should avoid the word “best” in the stem. Any necessary stimulus should be written with clear language following the rules for “plain language.” Any necessary stimulus text complexity should increase as the tiers increase. Tier 1 items should contain picture support in answer choices when possible to aid comprehension. Tier 2 items can contain picture support in answer choices. Tier 3 items should not contain picture support unless necessary. Tier 1 distractors should demonstrate clear misunderstanding of the concept or skill. Tier 2 distractors should be possible misunderstandings of the concept or skill. Limit to animal cells.
Allowable Stimulus Material	graphics; diagram; illustration
Context	No context required
Recommended Response Mechanisms	Multiple Choice (MC)
Construct-Relevant Vocabulary	cell membrane, function, osmosis, cell (animal), transport (across the cell membrane)
Cognitive Complexity	2

Evidence Statements	
Evidence Statements	**Tier 1** Students can identify that an animal cell has a cell membrane.
	Tier 2 Students can identify the cell membrane on a diagram or model.
	Tier 3 Students can identify that a cell membrane has a specific, important function.
Accessibility and Accommodation Considerations	
Stimulus Graphics Limitations	Stimulus graphics will be limited to clear photos, illustrations, diagrams, tables, and charts that directly relate to the passage topic. Information contained within stimulus graphics is ineligible for assessment unless specifically prescribed by Content Connector and/or evidence statements.
Linguistic Complexity	To be determined after IDOE review
Reference Tools	N/A

Sample Item	
Tier 3	Which statement describes the function of the cell membrane? A. It makes energy for the cell. **B. It controls what can enter or leave the cell.** C. It makes a copy of the DNA inside of the cell.

Reporting Category	Using Models to Describe and Explain Structure, Function, and Processes
Content Connector	**B.1.4.a.1:** Use a model to describe the specialized structures within cells (i.e. nuclei, ribosomes, Golgi, endoplasmic reticulum).
IAS Standard	**B.1.4:** Develop and use models to illustrate how specialized structures within cells (i.e. nuclei, ribosomes, Golgi, endoplasmic reticulum) interact to produce, modify, and transport proteins.
Content Limits	Tier 1 and 2 items should avoid the word “best” in the stem. Any necessary stimulus should be written with clear language following the rules for “plain language.” Any necessary stimulus text complexity should increase as the tiers increase. Tier 1 items should contain picture support in answer choices when possible to aid comprehension. Tier 2 items can contain picture support in answer choices. Tier 3 items should not contain picture support unless necessary. Tier 1 distractors should demonstrate clear misunderstanding of the concept or skill. Tier 2 distractors should be possible misunderstandings of the concept or skill. Assess only nuclei, ribosomes, Golgi apparatus, and endoplasmic reticulum (rough).
Allowable Stimulus Material	N/A
Context	No context required
Recommended Response Mechanisms	Multiple Choice (MC)
Construct-Relevant Vocabulary	organelle, nuclei, ribosomes, Golgi apparatus, endoplasmic reticulum (rough)
Cognitive Complexity	3

Evidence Statements	
Evidence Statements	**Tier 1** Given a model of a cell, students can recognize organelles.
	Tier 2 Students can match the name and description of organelles.
	Tier 3 Students can describe the function of organelles.
Accessibility and Accommodation Considerations	
Stimulus Graphic Limitations	Stimulus graphics will be limited to clear photos, illustrations, diagrams, tables, and charts that directly relate to the passage topic. Information contained within stimulus graphics is ineligible for assessment unless specifically prescribed by Content Connector and/or evidence statements.
Linguistic Complexity	To be determined after IDOE review
Reference Tools	N/A

<table>
<tr><th colspan="2">Sample Item</th></tr>
<tr><td>Tier 2</td><td>
Here is a model of a cell.


A student begins a list of the organelles and their description.

<table>
<tr><th>Organelle</th><th>Description</th></tr>
<tr><td>mitochondria</td><td>Produces energy for the cell</td></tr>
<tr><td>?</td><td>Stores the cell’s genetic material</td></tr>
<tr><td></td><td></td></tr>
<tr><td></td><td></td></tr>
</table>

What organelle should replace the question mark in the table?

A. vacuole
B. nucleus
C. cell membrane
</td></tr>
</table>

Reporting Category	Using Models to Describe and Explain Structure, Function, and Processes
Content Connector	**B.1.5.a.1:** Use a model to describe the organization of interacting systems (cell, tissue, organ, organ system) that provide specific functions within multicellular organisms.
IAS Standard	**B.1.5:** Develop and use a model to illustrate the hierarchical organization of interacting systems (cell, tissue, organ, organ system) that provide specific functions within multicellular organisms.
Content Limits	Tier 1 and 2 items should avoid the word “best” in the stem. Any necessary stimulus should be written with clear language following the rules for “plain language.” Any necessary stimulus text complexity should increase as the tiers increase. Tier 1 items should contain picture support in answer choices when possible to aid comprehension. Tier 2 items can contain picture support in answer choices. Tier 3 items should not contain picture support unless necessary. Tier 1 distractors should demonstrate clear misunderstanding of the concept or skill. Tier 2 distractors should be possible misunderstandings of the concept or skill. Do not assess specific tissue types or organs. Do not assess the interactions at the molecular level that give rise to different tissue types. Use animals, but not plants, as the context. Do not assess cellular respiration. Graphics are needed for each component.
Allowable Stimulus Material	graphics of cells; tissues; organs; and organ systems
Context	No context required
Recommended Response Mechanisms	Multiple Choice (MC)
Construct-Relevant Vocabulary	body systems, cell, circulatory, digestive, excretory, external stimuli, function, immune, integumentary, muscle, nervous, organ, reproductive, respiratory, skeletal, structure, tissue
Cognitive Complexity	5

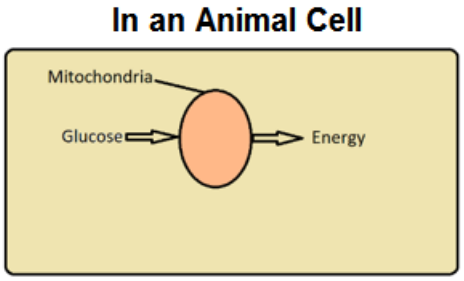
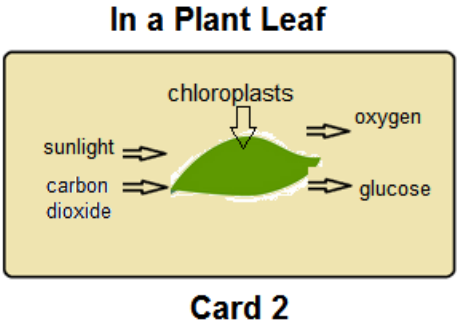
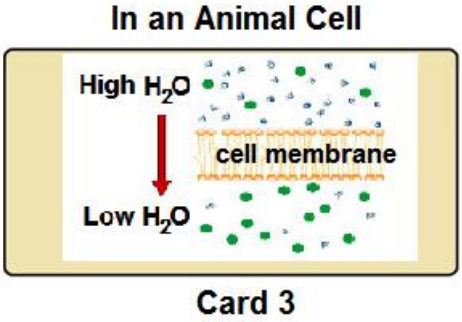
Evidence Statements	
Evidence Statements	**Tier 1** Students can recognize the levels and parts of an organ system.
	Tier 2 Students can put the interacting components of an organ system in order.
	Tier 3 Students can describe the functions of cells, tissues, organs, and organ systems. Students can identify interacting systems that perform a specific task.
Accessibility and Accommodation Considerations	
Stimulus Graphic Limitations	Stimulus graphics will be limited to clear photos, illustrations, diagrams, tables, and charts that directly relate to the passage topic. Information contained within stimulus graphics is ineligible for assessment unless specifically prescribed by Content Connector and/or evidence statements.
Linguistic Complexity	To be determined after IDOE review
Reference Tools	N/A

Sample Item	
Tier 2	What is the correct order for the organization of the digestive system? A. **cell → tissue → organs** B. tissue → organs → cells C. organs → cells → tissue

Updated: 07/19

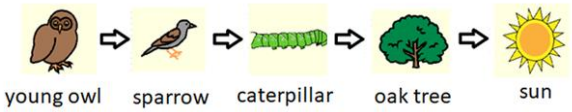
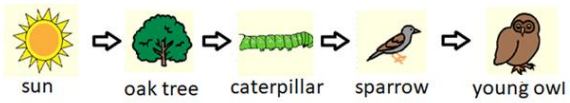
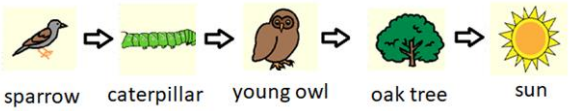
Reporting Category	Using Models to Describe and Explain Structure, Function, and Processes
Content Connector	**B.2.2.a.1:** Use a model to describe how cellular respiration results in a net transfer of energy.
IAS Standard	**B.2.2:** Use a model to illustrate that cellular respiration is a chemical process whereby the bonds of food molecules and oxygen molecules are broken and the bonds in new compounds are formed resulting in a net transfer of energy.
Content Limits	Tier 1 and 2 items should avoid the word “best” in the stem. Any necessary stimulus should be written with clear language following the rules for “plain language.” Any necessary stimulus text complexity should increase as the tiers increase. Tier 1 items should contain picture support in answer choices when possible to aid comprehension. Tier 2 items can contain picture support in answer choices. Tier 3 items should not contain picture support unless necessary. Tier 1 distractors should demonstrate clear misunderstanding of the concept or skill. Tier 2 distractors should be possible misunderstandings of the concept or skill.
Allowable Stimulus Material	N/A
Context	No context required
Recommended Response Mechanisms	Multiple Choice (MC) Multiple Select (MS) Table Match (TM)
Construct-Relevant Vocabulary	cellular respiration, transfer of energy
Cognitive Complexity	4

Evidence Statements	
Evidence Statements	**Tier 1** Students can recognize a model of cellular respiration.
	Tier 2 Students can use a model to identify the steps of cellular respiration.
	Tier 3 Students can use a model to explain how cellular respiration results in a net transfer of energy.
Accessibility and Accommodation Considerations	
Stimulus Graphic Limitations	Stimulus graphics will be limited to clear photos, illustrations, diagrams, tables, and charts that directly relate to the passage topic. Information contained within stimulus graphics is ineligible for assessment unless specifically prescribed by Content Connector and/or evidence statements.
Linguistic Complexity	To be determined after IDOE review
Reference Tools	N/A

Sample Item	
Tier 1	Which card shows a diagram of cellular respiration? A.  **(audio: Card 1—glucose goes into mitochondria, comes out as energy)** B.  (audio: Card 2—sunlight and carbon dioxide go into the leaf, into the chloroplasts, and comes out as oxygen and glucose) C.  (audio: Card 3—water flows across the cell membrane from high concentration to lower concentration

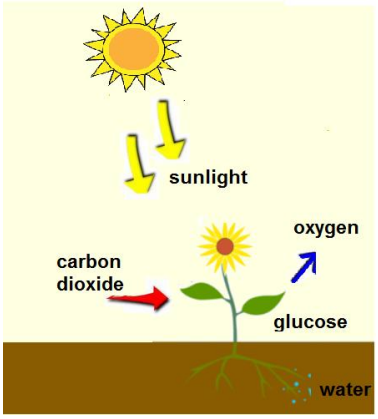
Reporting Category	Using Models to Describe and Explain Structure, Function, and Processes
Content Connector	**B.2.3.a.1:** Use visual representations to demonstrate the cycling of matter and flow of energy among organisms in an ecosystem.
IAS Standard	**B.2.3:** Use mathematical and/or computational representations to support claims for the cycling of matter and flow of energy among organisms in an ecosystem.
Content Limits	Tier 1 and 2 items should avoid the word “best” in the stem. Any necessary stimulus should be written with clear language following the rules for “plain language.” Any necessary stimulus text complexity should increase as the tiers increase. Tier 1 items should contain picture support in answer choices when possible to aid comprehension. Tier 2 items can contain picture support in answer choices. Tier 3 items should not contain picture support unless necessary. Tier 1 distractors should demonstrate clear misunderstanding of the concept or skill. Tier 2 distractors should be possible misunderstandings of the concept or skill. Limit representations to food web, energy pyramid, predator-prey relationship, or solar energy.
Allowable Stimulus Material	graphic of food web; energy pyramid; predator-prey relationship; or solar energy
Context	No context required
Recommended Response Mechanisms	Multiple Choice (MC) Multiple Select (MS) Table Match (TM)
Construct-Relevant Vocabulary	producer, consumer, transfer of energy, food web, predator-prey relationship, solar energy, reduction, energy pyramid
Cognitive Complexity	4

Evidence Statements	
Evidence Statements	**Tier 1** Students can identify the correct flow of energy in a food web, food chain, or energy pyramid (producer to consumer). Students can identify that the source of energy in a food web, food chain, or energy pyramid comes from the sun.
	Tier 2 Students can determine the missing part in a food web, food chain, or energy pyramid, including the source of energy.
	Tier 3 Students can identify the correct order of the flow of energy among the organisms in a given ecosystem.
Accessibility and Accommodation Considerations	
Stimulus Graphic Limitations	Stimulus graphics will be limited to clear photos, illustrations, diagrams, tables, and charts that directly relate to the passage topic. Information contained within stimulus graphics is ineligible for assessment unless specifically prescribed by Content Connector and/or evidence statements.
Linguistic Complexity	To be determined after IDOE review
Reference Tools	N/A

Sample Item	
Tier 3	Which diagram shows the correct order of energy flow through a food chain? A.  (audio: From a young owl to a sparrow, then to a caterpillar, an oak tree, and the sun) B.  **(audio: From the sun to an oak tree, then to a caterpillar, a sparrow, and a young owl)** C.  (audio: From the sparrow to a caterpillar, then to a young owl, an oak tree, and the sun)

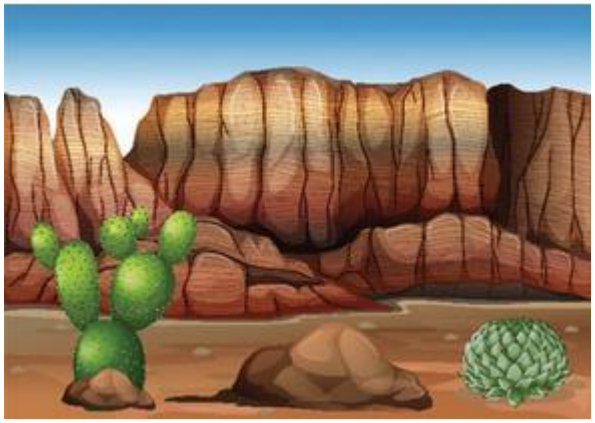
Reporting Category	Using Models to Describe and Explain Structure, Function, and Processes
Content Connector	**B.2.4.a.1:** Describe the role of photosynthesis and cellular respiration in the carbon cycle.
IAS Standard	**B.2.4:** Develop a model to illustrate the role of photosynthesis and cellular respiration in the cycling of carbon among the biosphere, atmosphere, hydrosphere, and geosphere.
Content Limits	Tier 1 and 2 items should avoid the word “best” in the stem. Any necessary stimulus should be written with clear language following the rules for “plain language.” Any necessary stimulus text complexity should increase as the tiers increase. Tier 1 items should contain picture support in answer choices when possible to aid comprehension. Tier 2 items can contain picture support in answer choices. Tier 3 items should not contain picture support unless necessary. Tier 1 distractors should demonstrate clear misunderstanding of the concept or skill. Tier 2 distractors should be possible misunderstandings of the concept or skill.
Allowable Stimulus Material	N/A
Context	No context required
Recommended Response Mechanisms	Multiple Choice (MC) Multiple Select (MS) Table Match (TM)
Construct-Relevant Vocabulary	photosynthesis, cellular respiration, carbon cycle
Cognitive Complexity	4

Evidence Statements	
Evidence Statements	**Tier 1** Students can identify the model representing cellular respiration or photosynthesis.
	Tier 2 Students can use a model to explain one part of cellular respiration or photosynthesis.
	Tier 3 Students can use a model to explain how cellular respiration and photosynthesis are connected.
Accessibility and Accommodation Considerations	
Stimulus Graphic Limitations	Stimulus graphics will be limited to clear photos, illustrations, diagrams, tables, and charts that directly relate to the passage topic. Information contained within stimulus graphics is ineligible for assessment unless specifically prescribed by Content Connector and/or evidence statements.
Linguistic Complexity	To be determined after IDOE review
Reference Tools	N/A

Sample Item	
Tier 2	Here is a diagram of photosynthesis.  Why must the plant take in water to conduct photosynthesis? A. The water makes the leaves turn green. B. The sunlight causes the water to evaporate from the leaves. C. **The carbon dioxide reacts with water to form glucose.**

Reporting Category	Using Models to Describe and Explain Structure, Function, and Processes
Content Connector	**B.3.1.a.1:** Explain how given resources (energy, water, oxygen, and minerals) place limits on an ecosystem's population.
IAS Standard	**B.3.1:** Use mathematical and/or computational representation to explain why the carrying capacity ecosystems can support is limited by the available energy, water, oxygen, and minerals and by the ability of ecosystems to recycle the remains of dead organisms.
Content Limits	Tier 1 and 2 items should avoid the word "best" in the stem. Any necessary stimulus should be written with clear language following the rules for "plain language." Any necessary stimulus text complexity should increase as the tiers increase. Tier 1 items should contain picture support in answer choices when possible to aid comprehension. Tier 2 items can contain picture support in answer choices. Tier 3 items should not contain picture support unless necessary. Tier 1 distractors should demonstrate clear misunderstanding of the concept or skill. Tier 2 distractors should be possible misunderstandings of the concept or skill. Limit resources to energy, water, oxygen, and minerals.
Allowable Stimulus Material	graphics; data table(s); or graph(s)
Context	Required for Tier 2 and 3
Recommended Response Mechanisms	Multiple Choice (MC)
Construct-Relevant Vocabulary	resources, energy, limits, water, oxygen, mineral, ecosystem, population
Cognitive Complexity	3

Evidence Statements	
Evidence Statements	**Tier 1** Students can identify resources in an ecosystem.
	Tier 2 Students can identify the importance of each resource to a given an ecosystem.
	Tier 3 Students can determine the effect of a limited or abundant resource on a given ecosystem.
Accessibility and Accommodation Considerations	
Stimulus Graphic Limitations	Stimulus graphics will be limited to clear photos, illustrations, diagrams, tables, and charts that directly relate to the passage topic. Information contained within stimulus graphics is ineligible for assessment unless specifically prescribed by Content Connector and/or evidence statements.
Linguistic Complexity	To be determined after IDOE review
Reference Tools	N/A

Sample Item	
Tier 3	Here is a desert ecosystem.  How have the plants adapted to limited rainfall in this ecosystem? A. They grow sharp spines. B. They change water into oxygen. C. **They store water in their stems or leaves.**

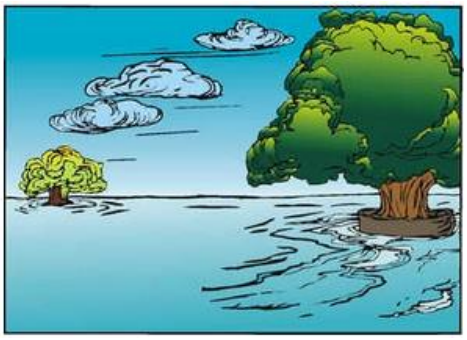
Reporting Category	Using Models to Describe and Explain Structure, Function, and Processes
Content Connector	**B.3.2.a.1:** Demonstrate how human activities and natural phenomena can change the flow of matter and energy in an ecosystem.
IAS Standard	**B.3.2:** Design, evaluate, and refine a model which shows how human activities and natural phenomena can change the flow of matter and energy in an ecosystem and how those changes impact the environment and biodiversity of populations in ecosystems of different scales, as well as, how these human impacts can be reduced.
Content Limits	Tier 1 and 2 items should avoid the word “best” in the stem. Any necessary stimulus should be written with clear language following the rules for “plain language.” Any necessary stimulus text complexity should increase as the tiers increase. Tier 1 items should contain picture support in answer choices when possible to aid comprehension. Tier 2 items can contain picture support in answer choices. Tier 3 items should not contain picture support unless necessary. Tier 1 distractors should demonstrate clear misunderstanding of the concept or skill. Tier 2 distractors should be possible misunderstandings of the concept or skill. Exclude phenomena at the cellular level.
Allowable Stimulus Material	N/A
Context	No context required
Recommended Response Mechanisms	Multiple Choice (MC) Multiple Select (MS) Table Match (TM)
Construct-Relevant Vocabulary	phenomena, ecosystem, matter, energy
Cognitive Complexity	4

Evidence Statements	
Evidence Statements	**Tier 1** Students can identify different types of human activity that can disrupt the flow of matter and energy in an ecosystem.
	Tier 2 Using a model, students can evaluate the changes in an ecosystem caused by natural or man-made imbalances.
	Tier 3 Students can explain the effects human and natural activity have on populations in an ecosystem. Students can identify how the impact of human and natural activity in an ecosystem can be reduced or limited.
Accessibility and Accommodation Considerations	
Stimulus Graphic Limitations	Stimulus graphics will be limited to clear photos, illustrations, diagrams, tables, and charts that directly relate to the passage topic. Information contained within stimulus graphics is ineligible for assessment unless specifically prescribed by Content Connector and/or evidence statements.
Linguistic Complexity	To be determined after IDOE review
Reference Tools	N/A

Sample Item	
Tier 3	Here is a diagram that shows the flow of energy in an ecosystem.  What would happen if humans cut down the trees in this ecosystem? A. The giraffes would start eating lions. B. The lions and giraffes would start eating meat only. C. **The giraffes would have to find other food to eat.**

Reporting Category	Using Models to Describe and Explain Structure, Function, and Processes
Content Connector	**B.3.2.a.2:** Identify how human activities and natural phenomena impact the environment and biodiversity of populations in ecosystems.
IAS Standard	**B.3.2:** Design, evaluate, and refine a model which shows how human activities and natural phenomena can change the flow of matter and energy in an ecosystem and how those changes impact the environment and biodiversity of populations in ecosystems of different scales, as well as, how these human impacts can be reduced.
Content Limits	Tier 1 and 2 items should avoid the word “best” in the stem. Any necessary stimulus should be written with clear language following the rules for “plain language.” Any necessary stimulus text complexity should increase as the tiers increase. Tier 1 items should contain picture support in answer choices when possible to aid comprehension. Tier 2 items can contain picture support in answer choices. Tier 3 items should not contain picture support unless necessary. Tier 1 distractors should demonstrate clear misunderstanding of the concept or skill. Tier 2 distractors should be possible misunderstandings of the concept or skill. Exclude phenomena at the cellular level.
Allowable Stimulus Material	graphics; table(s); graph(s)
Context	No context required
Recommended Response Mechanisms	Multiple Choice (MC)
Construct-Relevant Vocabulary	phenomena(non), environment, biodiversity, ecosystem
Cognitive Complexity	2

Evidence Statements	
Evidence Statements	**Tier 1** Students can identify human activities in an ecosystem. Students can identify natural phenomena in an ecosystem.
	Tier 2 Students determine which human activity or natural phenomenon took place in an ecosystem (e.g., drought, cutting down trees, etc.).
	Tier 3 Students identify the cause and effect relationship of human activity or a natural phenomenon in an ecosystem.
Accessibility and Accommodation Considerations	
Stimulus Graphic Limitations	Stimulus graphics will be limited to clear photos, illustrations, diagrams, tables, and charts that directly relate to the passage topic. Information contained within stimulus graphics is ineligible for assessment unless specifically prescribed by Content Connector and/or evidence statements.
Linguistic Complexity	To be determined after IDOE review
Reference Tools	N/A

Sample Item	
Tier 2	Here is a picture of a flooded forest ecosystem.  What natural phenomenon affected this ecosystem? A. a drought B. a tornado C. **a rainstorm**

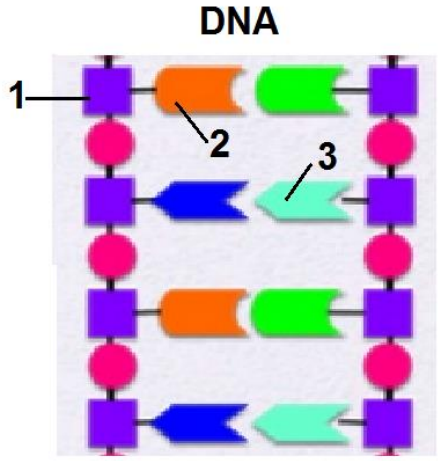
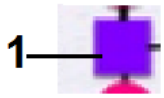
Reporting Category	Using Models to Describe and Explain Structure, Function, and Processes
Content Connector	**B.3.2.a.3:** Describe how human impact on ecosystems can be reduced.
IAS Standard	**B.3.2:** Design, evaluate, and refine a model which shows how human activities and natural phenomena can change the flow of matter and energy in an ecosystem and how those changes impact the environment and biodiversity of populations in ecosystems of different scales, as well as, how these human impacts can be reduced.
Content Limits	Tier 1 and 2 items should avoid the word “best” in the stem. Any necessary stimulus should be written with clear language following the rules for “plain language.” Any necessary stimulus text complexity should increase as the tiers increase. Tier 1 items should contain picture support in answer choices when possible to aid comprehension. Tier 2 items can contain picture support in answer choices. Tier 3 items should not contain picture support unless necessary. Tier 1 distractors should demonstrate clear misunderstanding of the concept or skill. Tier 2 distractors should be possible misunderstandings of the concept or skill.
Allowable Stimulus Material	graphics; table(s); graph(s)
Context	No context required
Recommended Response Mechanisms	Multiple Choice (MC) Multiple Select (MS) Table Match (TM)
Construct-Relevant Vocabulary	human impact, ecosystems, recycling
Cognitive Complexity	2

Evidence Statements	
Evidence Statements	**Tier 1** Students can identify human impact on an ecosystem.
	Tier 2 Students can identify how humans can reduce their impact on an ecosystem (e.g., recycling, filtering water).
	Tier 3 Students can describe ways to reduce the human impact on an ecosystem.
Accessibility and Accommodation Considerations	
Stimulus Graphic Limitations	Stimulus graphics will be limited to clear photos, illustrations, diagrams, tables, and charts that directly relate to the passage topic. Information contained within stimulus graphics is ineligible for assessment unless specifically prescribed by Content Connector and/or evidence statements.
Linguistic Complexity	To be determined after IDOE review
Reference Tools	N/A

Sample Item	
Tier 3	How can humans reduce impact within an ecosystem? A. drilling oil wells B. **recycling bottles** C. cutting down trees

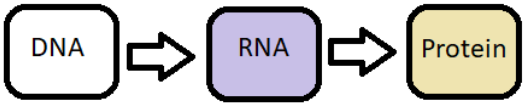
Reporting Category	Using Models to Describe and Explain Structure, Function, and Processes
Content Connector	**B.4.1.a.1:** Describe how DNA and chromosomes influence traits passed from parents to offspring.
IAS Standard	**B.4.1:** Develop and revise a model that clarifies the relationship between DNA and chromosomes in coding the instructions for characteristic traits passed from parents to offspring.
Content Limits	Tier 1 and 2 items should avoid the word “best” in the stem. Any necessary stimulus should be written with clear language following the rules for “plain language.” Any necessary stimulus text complexity should increase as the tiers increase. Tier 1 items should contain picture support in answer choices when possible to aid comprehension. Tier 2 items can contain picture support in answer choices. Tier 3 items should not contain picture support unless necessary. Tier 1 distractors should demonstrate clear misunderstanding of the concept or skill. Tier 2 distractors should be possible misunderstandings of the concept or skill. Do not assess the distinction between chromatids and chromosomes, centromeres, telomeres, and histones.
Allowable Stimulus Material	N/A
Context	No context required
Recommended Response Mechanisms	Multiple Choice (MC)
Construct-Relevant Vocabulary	allele, codominance, dominant, fertilization, genome, genotype, haploid, meiosis, mitosis, parent generation, pedigree, phenotype, protein, Punnett square, recessive, replication, sex-linked, zygote
Cognitive Complexity	4

Evidence Statements	
Evidence Statements	**Tier 1** Students can identify that a gene is found on a chromosome. Students can identify that a gene can be passed from parent to offspring.
	Tier 2 Using a model, students can identify the structures that make up DNA (backbone, sugar, nucleotide). Students can identify that genes influence traits.
	Tier 3 Students can identify that not all of the parents' genes are passed to an offspring.
Accessibility and Accommodation Considerations	
Stimulus Graphic Limitations	Stimulus graphics will be limited to clear photos, illustrations, diagrams, tables, and charts that directly relate to the passage topic. Information contained within stimulus graphics is ineligible for assessment unless specifically prescribed by Content Connector and/or evidence statements.
Linguistic Complexity	To be determined after IDOE review
Reference Tools	N/A

Sample Item	
Tier 2	Here is part of a model of DNA. There are three parts numbered.  Which numbered part is sugar? **A.**  **KEY** B.  C. 

Reporting Category	Using Models to Describe and Explain Structure, Function, and Processes
Content Connector	**B.4.2.a.1:** Explain how the structure of DNA determines the structure of proteins that carry out essential functions of life through systems of specialized cells.
IAS Standard	**B.4.2:** Construct an explanation for how the structure of DNA determines the structure of proteins which carry out the essential functions of life through systems of specialized cells.
Content Limits	Tier 1 and 2 items should avoid the word “best” in the stem. Any necessary stimulus should be written with clear language following the rules for “plain language.” Any necessary stimulus text complexity should increase as the tiers increase. Tier 1 items should contain picture support in answer choices when possible to aid comprehension. Tier 2 items can contain picture support in answer choices. Tier 3 items should not contain picture support unless necessary. Tier 1 distractors should demonstrate clear misunderstanding of the concept or skill. Tier 2 distractors should be possible misunderstandings of the concept or skill.
Allowable Stimulus Material	N/A
Context	No context required
Recommended Response Mechanisms	Multiple Choice (MC) Multiple Select (MS) Table Match (TM)
Construct-Relevant Vocabulary	DNA, protein, essential functions, specialized cells, amino acid
Cognitive Complexity	4

Evidence Statements	
Evidence Statements	**Tier 1** Students can identify the structural parts or functions of DNA, RNA, and/or proteins.
	Tier 2 Students can identify a model or description explaining the flow of information in the cell from DNA to RNA.
	Tier 3 Students can use a model to describe flow of information in the cell from DNA to RNA to proteins.
Accessibility and Accommodation Considerations	
Stimulus Graphic Limitations	Stimulus graphics will be limited to clear photos, illustrations, diagrams, tables, and charts that directly relate to the passage topic. Information contained within stimulus graphics is ineligible for assessment unless specifically prescribed by Content Connector and/or evidence statements.
Linguistic Complexity	To be determined after IDOE review
Reference Tools	N/A

Sample Item	
Tier 3	Which diagram shows how information is used to create proteins? A.  (audio: from RNA to the Protein to DNA) B.  **(audio: from DNA to RNA to the Protein)** C.  (audio: from RNA to DNA to the Protein)

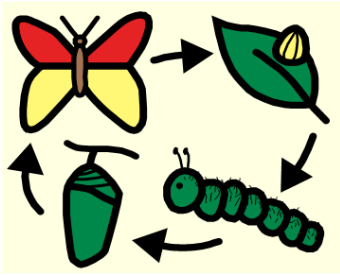
Reporting Category	Using Models to Describe and Explain Structure, Function, and Processes
Content Connector	**B.4.3.a.1:** Model the primary structure of protein as determined by the sequence of its amino acids and DNA codes.
IAS Standard	**B.4.3:** Construct a model to explain that the unique shape and function of each protein is determined by the sequence of its amino acids, and thus is determined by the sequence of the DNA that codes for this protein.
Content Limits	Tier 1 and 2 items should avoid the word “best” in the stem. Any necessary stimulus should be written with clear language following the rules for “plain language.” Any necessary stimulus text complexity should increase as the tiers increase. Tier 1 items should contain picture support in answer choices when possible to aid comprehension. Tier 2 items can contain picture support in answer choices. Tier 3 items should not contain picture support unless necessary. Tier 1 distractors should demonstrate clear misunderstanding of the concept or skill. Tier 2 distractors should be possible misunderstandings of the concept or skill.
Allowable Stimulus Material	graphics; diagrams
Context	No context required
Recommended Response Mechanisms	Multiple Choice (MC)
Construct-Relevant Vocabulary	thymine, guanine, cytosine, adenine, amino acid, DNA code, double-helix, protein, sequence, nucleotide, sugar-phosphate backbone
Cognitive Complexity	5

Evidence Statements	
Evidence Statements	**Tier 1** Students can identify that the primary structure of a protein is determined by the sequence of its amino acids. Students can identify that the sequence of amino acids is determined by a specific DNA code.
	Tier 2 Students can determine which molecules combine to create the structure of DNA.
	Tier 3 When given the structure of a DNA sequence, students can determine its code.
Accessibility and Accommodation Considerations	
Stimulus Graphic Limitations	Stimulus graphics will be limited to clear photos, illustrations, diagrams, tables, and charts that directly relate to the passage topic. Information contained within stimulus graphics is ineligible for assessment unless specifically prescribed by Content Connector and/or evidence statements.
Linguistic Complexity	To be determined after IDOE review
Reference Tools	N/A

Sample Item	
Tier 2	Which molecules combine to form the structure of DNA? A. **adenine and thymine** B. thymine and guanine C. cytosine and adenine

Reporting Category	Using Models to Describe and Explain Structure, Function, and Processes
Content Connector	**B.4.4.a.1:** Use a model to illustrate the role of cellular division (mitosis) and differentiation in producing and maintaining complex organisms.
IAS Standard	**B.4.4:** Use a model to illustrate the role of cellular division (mitosis) and differentiation in producing and maintaining complex organisms.
Content Limits	Tier 1 and 2 items should avoid the word “best” in the stem. Any necessary stimulus should be written with clear language following the rules for “plain language.” Any necessary stimulus text complexity should increase as the tiers increase. Tier 1 items should contain picture support in answer choices when possible to aid comprehension. Tier 2 items can contain picture support in answer choices. Tier 3 items should not contain picture support unless necessary. Tier 1 distractors should demonstrate clear misunderstanding of the concept or skill. Tier 2 distractors should be possible misunderstandings of the concept or skill.
Allowable Stimulus Material	N/A
Context	No context required
Recommended Response Mechanisms	Multiple Choice (MC) Multiple Select (MS) Table Match (TM)
Construct-Relevant Vocabulary	cellular division, differentiation, complex, mitosis, organism, cell
Cognitive Complexity	4

Evidence Statements	
Evidence Statements	**Tier 1** Students can identify a model representing mitosis.
	Tier 2 Students can use a model to explain one part of mitosis.
	Tier 3 Students can use a model to explain the role of mitosis in the life-cycle of an organism.
Accessibility and Accommodation Considerations	
Stimulus Graphic Limitations	Stimulus graphics will be limited to clear photos, illustrations, diagrams, tables, and charts that directly relate to the passage topic. Information contained within stimulus graphics is ineligible for assessment unless specifically prescribed by Content Connector and/or evidence statements.
Linguistic Complexity	To be determined after IDOE review
Reference Tools	N/A

Sample Item	
Tier 3	The diagram shows the butterfly life cycle.  **butterfly life cycle** Which process helps the butterfly form new cells as it grows? A. **mitosis** B. photosynthesis C. cellular respiration

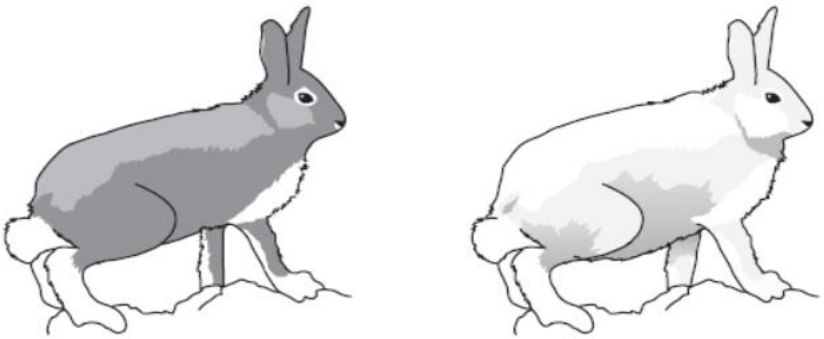
Reporting Category	Communicating Explanations and Evaluating Claims Using Evidence
Content Connector	**B.5.1.a.1:** Describe how organisms are named and classified (e.g., based on evolutionary relationships and taxonomic categories).
IAS Standard	**B.5.1:** Evaluate anatomical and molecular evidence to provide an explanation of how organisms are classified and named based on their evolutionary relationships into taxonomic categories.
Content Limits	Tier 1 and 2 items should avoid the word “best” in the stem. Any necessary stimulus should be written with clear language following the rules for “plain language.” Any necessary stimulus text complexity should increase as the tiers increase. Tier 1 items should contain picture support in answer choices when possible to aid comprehension. Tier 2 items can contain picture support in answer choices. Tier 3 items should not contain picture support unless necessary. Tier 1 distractors should demonstrate clear misunderstanding of the concept or skill. Tier 2 distractors should be possible misunderstandings of the concept or skill. Limit examples to animals. Do not assess kingdom, phylum, class, order, family, genus, or species. Do not use cladograms. For Tier 1 and 2, do not assess or use molecular evidence. For Tier 3, limit molecular evidence to the gene level; do not assess proteins or gene expression.
Allowable Stimulus Material	graphics
Context	No context required
Recommended Response Mechanisms	Multiple Choice (MC) Multiple Select (MS) Table Match (TM)
Construct-Relevant Vocabulary	anatomical, ancestor, ancestry, diversity, evolve, extinct, extinction, fossil, mineral, multicellular, organelles, organism, species, structure, unicellular, gene, evolution, taxonomic

Cognitive Complexity	3
Evidence Statements	
Evidence Statements	**Tier 1** Students can identify relationships based on gross physical/external characteristics (e.g., mammals vs. non-mammals).
	Tier 2 Students can identify relationships based on finer physical/external characteristics (e.g., three- vs. four-toed).
	Tier 3 Students can identify relationships based on the number of similar genes.
Accessibility and Accommodation Considerations	
Stimulus Graphic Limitations	Stimulus graphics will be limited to clear photos, illustrations, diagrams, tables, and charts that directly relate to the passage topic. Information contained within stimulus graphics is ineligible for assessment unless specifically prescribed by Content Connector and/or evidence statements.
Linguistic Complexity	To be determined after IDOE review
Reference Tools	N/A

Sample Item	
Tier 2	Here is a picture of an animal with feathers.  Which animal would be in the same category as this one? A. alligator B. **chicken** C. elephant

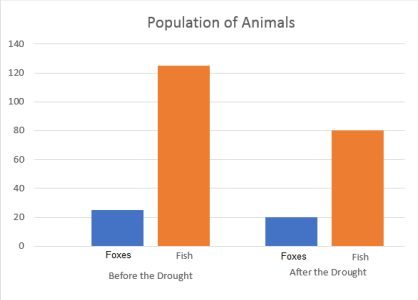
Reporting Category	Communicating Explanations and Evaluating Claims Using Evidence
Content Connector	**B.5.4.a.1:** Explain the role of natural selection in adaptation of species.
IAS Standard	**B.5.4:** Evaluate evidence to explain the role of natural selection as an evolutionary mechanism that leads to the adaptation of species, and to support claims that changes in environmental conditions may result in: (1) increases in the number of individuals of some species, (2) the emergence of new species over time, and/or (3) the extinction of other species.
Content Limits	Tier 1 and 2 items should avoid the word “best” in the stem. Any necessary stimulus should be written with clear language following the rules for “plain language.” Any necessary stimulus text complexity should increase as the tiers increase. Tier 1 items should contain picture support in answer choices when possible to aid comprehension. Tier 2 items can contain picture support in answer choices. Tier 3 items should not contain picture support unless necessary. Tier 1 distractors should demonstrate clear misunderstanding of the concept or skill. Tier 2 distractors should be possible misunderstandings of the concept or skill. Evidence will be limited to that of the natural world. Do not assess human populations.
Allowable Stimulus Material	population graph
Context	Required
Recommended Response Mechanisms	Multiple Choice (MC)
Construct-Relevant Vocabulary	abiotic, adaptation, advantageous, beneficial change, biotic, bottleneck effect, detrimental change, distribution, diverge, emergence, evolution, founder effect, frequency, gene, gene flow, gene pool, genetic variation, geographic isolation, heritable, hybrid, island effect, mutation, natural selection, population, proliferation, sexual reproduction, speciation, trend, extinction, favorable traits
Cognitive Complexity	5

Evidence Statements	
Evidence Statements	**Tier 1** Students can explain that populations can change over time.
	Tier 2 Students can understand that heritable, favorable traits in an individual can lead to increased offspring for that individual. Students can understand that traits better adapted to an environment increase in a population over time. Students can read and interpret a simple population graph with one species.
	Tier 3 Students can identify which physical traits in a population are favorable to survival. Students can read and interpret a simple population graph with two species (e.g., predator/prey).
Accessibility and Accommodation Considerations	
Stimulus Graphic Limitations	Stimulus graphics will be limited to clear photos, illustrations, diagrams, tables, and charts that directly relate to the passage topic. Information contained within stimulus graphics is ineligible for assessment unless specifically prescribed by Content Connector and/or evidence statements.
Linguistic Complexity	To be determined after IDOE review
Reference Tools	N/A

Sample Item	
Tier 2	The Arctic rabbits' fur can change colors. Their fur is brown in the summer. Their fur is white in the winter. The picture shows an Arctic rabbit in summer and in winter.  Fur in summer Fur in winter Over time, the number of snowy days has increased. Which statement explains how the population of rabbits are affected by longer winters? A. Their ears grow shorter. B. Their feet become smaller. C. **Their fur stays white longer.**

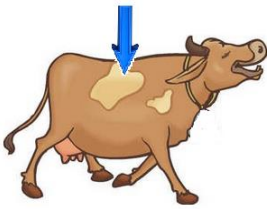
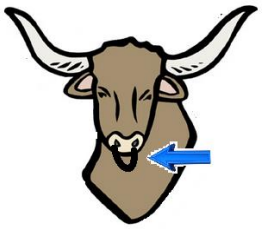
Reporting Category	Communicating Explanations and Evaluating Claims Using Evidence
Content Connector	**B.5.4.a.2:** Describe how environmental conditions may result in: (1) increases in the number of individuals of some species, (2) the emergence of new species over time, and/or (3) the extinction of other species.
IAS Standard	**B.5.4:** Evaluate evidence to explain the role of natural selection as an evolutionary mechanism that leads to the adaptation of species, and to support claims that changes in environmental conditions may result in: (1) increases in the number of individuals of some species, (2) the emergence of new species over time, and/or (3) the extinction of other species.
Content Limits	Tier 1 and 2 items should avoid the word “best” in the stem. Any necessary stimulus should be written with clear language following the rules for “plain language.” Any necessary stimulus text complexity should increase as the tiers increase. Tier 1 items should contain picture support in answer choices when possible to aid comprehension. Tier 2 items can contain picture support in answer choices. Tier 3 items should not contain picture support unless necessary. Tier 1 distractors should demonstrate clear misunderstanding of the concept or skill. Tier 2 distractors should be possible misunderstandings of the concept or skill. Limit evidence to that of the natural world. Limit environmental change to climate and resources.
Allowable Stimulus Material	population graph
Context	No context required
Recommended Response Mechanisms	Multiple Choice (MC) Multiple Select (MS) Table Match (TM)
Construct-Relevant Vocabulary	abiotic, adaptation, advantageous, beneficial change, biotic, bottleneck effect, detrimental change, distribution, diverge, emergence, evolution, founder effect, frequency, gene, gene flow, gene pool, genetic variation, geographic isolation, heritable, hybrid, island effect, mutation, natural

	selection, population, proliferation, sexual reproduction, speciation, trend, extinction, favorable traits
Cognitive Complexity	5
Evidence Statements	
Evidence Statements	**Tier 1** Students can identify an environmental change.
	Tier 2 Students can explain how an environmental change can affect a species over time. Students can read and interpret a simple population graph with one species.
	Tier 3 Students can read and interpret a simple population graph with two species (e.g., predator/prey). Students can interpret scenarios regarding how various environmental factors can lead to the extinction of a species.
Accessibility and Accommodation Considerations	
Stimulus Graphic Limitations	Stimulus graphics will be limited to clear photos, illustrations, diagrams, tables, and charts that directly relate to the passage topic. Information contained within stimulus graphics is ineligible for assessment unless specifically prescribed by Content Connector and/or evidence statements.
Linguistic Complexity	To be determined after IDOE review
Reference Tools	N/A

Sample Item	
Tier 3	Foxes eat fish from a pond. The population graph shows the number of foxes and fish before and after a drought.  How did the drought affect the population of fish? A. The number of fish increased. B. **The number of fish decreased.** C. The number of fish stayed the same.

Reporting Category	Communicating Explanations and Evaluating Claims Using Evidence
Content Connector	**B.5.5.a.1:** Describe the four primary factors affecting evolution: (1) the potential for a species to increase in number, (2) the heritable genetic variation of individuals in a species due to mutation and sexual reproduction, (3) competition for limited resources, and (4) the proliferation of those organisms that are better able to survive and reproduce in the environment.
IAS Standard	**B.5.5:** Construct an explanation based on evidence that the process of evolution primarily results from four factors: (1) the potential for a species to increase in number, (2) the heritable genetic variation of individuals in a species due to mutation and sexual reproduction, (3) competition for limited resources, and (4) the proliferation of those organisms that are better able to survive and reproduce in the environment.
Content Limits	Tier 1 and 2 items should avoid the word “best” in the stem. Any necessary stimulus should be written with clear language following the rules for “plain language.” Any necessary stimulus text complexity should increase as the tiers increase. Tier 1 items should contain picture support in answer choices when possible to aid comprehension. Tier 2 items can contain picture support in answer choices. Tier 3 items should not contain picture support unless necessary. Tier 1 distractors should demonstrate clear misunderstanding of the concept or skill. Tier 2 distractors should be possible misunderstandings of the concept or skill. Do not assess types of natural selection. Do not assess specific types of mutation.
Allowable Stimulus Material	N/A
Context	No context required
Recommended Response Mechanisms	Multiple Choice (MC)
Construct-Relevant Vocabulary	abiotic, adaptation, advantageous, beneficial change, biotic, detrimental change, distribution, diverge, emergence, evolution, frequency, gene, genetic variation, geographic isolation, heritable, mutation, natural selection, proliferation, sexual reproduction, limiting factors

Cognitive Complexity	4
Evidence Statements	
Evidence Statements	**Tier 1** Students can identify inherited variations in a population.
	Tier 2 Students can compare variations in a population and predict which one gives individuals a better chance of survival. Students can identify limiting factors in an environment.
	Tier 3 Students can compare characteristics of two species and predict which has a better chance of survival based on the environment.
Accessibility and Accommodation Considerations	
Stimulus Graphic Limitations	Stimulus graphics will be limited to clear photos, illustrations, diagrams, tables, and charts that directly relate to the passage topic. Information contained within stimulus graphics is ineligible for assessment unless specifically prescribed by Content Connector and/or evidence statements.
Linguistic Complexity	To be determined after IDOE review
Reference Tools	N/A

Sample Item	
Tier 1	Which is a cow with an inherited trait?  A. bell (audio: a cow with bell)  B. spots **(audio: a cow with spots)**  C. nose ring (audio: a cow with nose ring)

Reporting Category	Communicating Explanations and Evaluating Claims Using Evidence
Content Connector	**SEPS.1:** Posing questions (for science) and defining problems (for engineering): A practice of science is posing and refining questions that lead to descriptions and explanations of how the natural and designed world(s) work and these questions can be scientifically tested. Engineering questions clarify problems to determine criteria for possible solutions and identify constraints to solve problems about the designed world.
IAS Standard	**SEPS.1:** Posing questions (for science) and defining problems (for engineering): A practice of science is posing and refining questions that lead to descriptions and explanations of how the natural and designed world(s) work and these questions can be scientifically tested. Engineering questions clarify problems to determine criteria for possible solutions and identify constraints to solve problems about the designed world.
Content Limits	Tier 1 and 2 items should avoid the word “best” in the stem. Any necessary stimulus should be written with clear language following the rules for “plain language.” Any necessary stimulus text complexity should increase as the tiers increase. Tier 1 items should contain picture support in answer choices when possible to aid comprehension. Tier 2 items can contain picture support in answer choices. Tier 3 items should not contain picture support unless necessary. Tier 1 distractors should demonstrate clear misunderstanding of the concept or skill. Tier 2 distractors should be possible misunderstandings of the concept or skill. Limit to scientific questions (not engineering). Limit the scope of the scenario (basic).
Allowable Stimulus Material	N/A
Context	No context required
Recommended Response Mechanisms	Multiple Choice (MC) Multiple Select (MS) Table Match (TM)

Construct-Relevant Vocabulary	criteria, data, experiment, impact, investigation, solution, variable, testable, relevant
Cognitive Complexity	4
Evidence Statements	
Evidence Statements	**Tier 1** Students can identify a testable question given a scenario.
	Tier 2 Students can identify a relevant question based on a scenario.
	Tier 3 Students can identify a relevant and/or testable question that matches the scenario.
Accessibility and Accommodation Considerations	
Stimulus Graphic Limitations	Stimulus graphics will be limited to clear photos, illustrations, diagrams, tables, and charts that directly relate to the passage topic. Information contained within stimulus graphics is ineligible for assessment unless specifically prescribed by Content Connector and/or evidence statements.
Linguistic Complexity	To be determined after IDOE review
Reference Tools	N/A

Sample Item	
Tier 3	Students are investigating the role that temperature has in evaporation and condensation. The students listed several questions in this table. Which question is relevant to the students' investigation? A. Where is freshwater found on Earth? B. How long does it take for water to freeze? C. **What is the temperature when water boils?**

Reporting Category	Using Models to Describe and Explain Structure, Function, and Processes
Content Connector	**SEPS.2:** Developing and using models and tools: A practice of both science and engineering is to use and construct conceptual models that illustrate ideas and explanations. Models are used to develop questions, predictions and explanations; analyze and identify flaws in systems; build and revise scientific explanations and proposed engineered systems; and communicate ideas. Measurements and observations are used to revise and improve models and designs. Models include, but are not limited to: diagrams, drawings, physical replicas, mathematical representations, analogies, and other technological models. Another practice of both science and engineering is to identify and correctly use tools to construct, obtain, and evaluate questions and problems. Utilize appropriate tools while identifying their limitations. Tools include, but are not limited to: pencil and paper, models, ruler, a protractor, a calculator, laboratory equipment, safety gear, a spreadsheet, experiment data collection software, and other technological tools.
IAS Standard	**SEPS.2:** Developing and using models and tools: A practice of both science and engineering is to use and construct conceptual models that illustrate ideas and explanations. Models are used to develop questions, predictions and explanations; analyze and identify flaws in systems; build and revise scientific explanations and proposed engineered systems; and communicate ideas. Measurements and observations are used to revise and improve models and designs. Models include, but are not limited to: diagrams, drawings, physical replicas, mathematical representations, analogies, and other technological models. Another practice of both science and engineering is to identify and correctly use tools to construct, obtain, and evaluate questions and problems. Utilize appropriate tools while identifying their limitations. Tools include, but are not limited to: pencil and paper, models, ruler, a protractor, a calculator, laboratory equipment, safety gear, a spreadsheet, experiment data collection software, and other technological tools.

Content Limits	Tier 1 and 2 items should avoid the word “best” in the stem. Any necessary stimulus should be written with clear language following the rules for “plain language.” Any necessary stimulus text complexity should increase as the tiers increase. Tier 1 items should contain picture support in answer choices when possible to aid comprehension. Tier 2 items can contain picture support in answer choices. Tier 3 items should not contain picture support unless necessary. Tier 1 distractors should demonstrate clear misunderstanding of the concept or skill. Tier 2 distractors should be possible misunderstandings of the concept or skill.
Allowable Stimulus Material	pictures of models; diagrams; pictures of given tools
Context	Required
Recommended Response Mechanisms	Multiple Choice (MC) Multiple Select (MS) Table Match (TM)
Construct-Relevant Vocabulary	constraint, criteria, data, design, experiment, impact, investigation, limitation, solution, variable
Cognitive Complexity	3
Evidence Statements	
Evidence Statements	**Tier 1** Students can select the correct model using a scenario. Students can identify appropriate units for a given tool.
	Tier 2 Students can select the most appropriate model to use. Students can identify the correct measurements in a given scenario. Students can identify which step is missing in a model.
	Tier 3 Students can develop a model to test their questions. (Assemble from components; construct graphs; correct/refine/revise an existing model.) Students can identify which steps are missing in a model.
Accessibility and Accommodation Considerations	

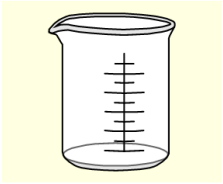
Stimulus Graphic Limitations	Stimulus graphics will be limited to clear photos, illustrations, diagrams, tables, and charts that directly relate to the passage topic. Information contained within stimulus graphics is ineligible for assessment unless specifically prescribed by Content Connector and/or evidence statements.
Linguistic Complexity	To be determined after IDOE review
Reference Tools	N/A

Sample Item	
Tier 3	A student wants to show the levels of organization of the body. Which model should the student use to show the correct order? A. tissue→ organ system → organism → cells B. organism → cells→ tissue→ organ system C. **cells → tissue → organ system →organism**

Updated: 07/19

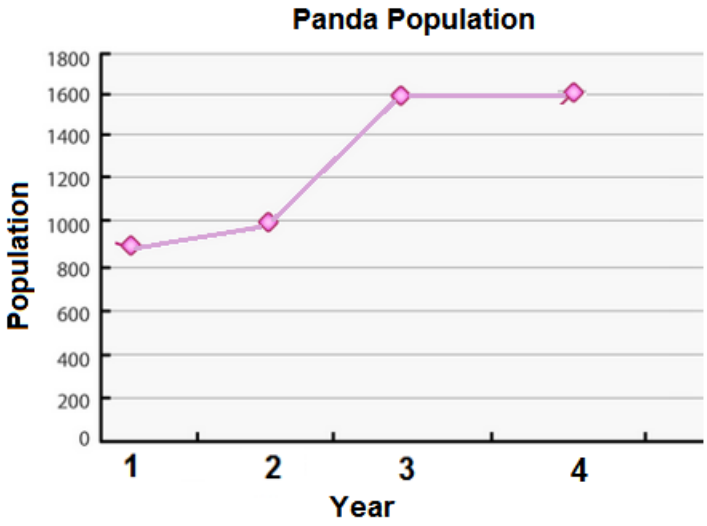
Reporting Category	Using Models to Describe and Explain Structure, Function, and Processes
Content Connector	**SEPS.3:** Constructing and performing investigations: Scientists and engineers are constructing and performing investigations in the field or laboratory, working collaboratively as well as individually. Researching analogous problems in order to gain insight into possible solutions allows them to make conjectures about the form and meaning of the solution. A plan to a solution pathway is developed prior to constructing and performing investigations. Constructing investigations systematically encompasses identified variables and parameters generating quality data. While performing, scientists and engineers monitor and record progress. After performing, they evaluate to make changes to modify and repeat the investigation if necessary.
IAS Standard	**SEPS.3:** Constructing and performing investigations: Scientists and engineers are constructing and performing investigations in the field or laboratory, working collaboratively as well as individually. Researching analogous problems in order to gain insight into possible solutions allows them to make conjectures about the form and meaning of the solution. A plan to a solution pathway is developed prior to constructing and performing investigations. Constructing investigations systematically encompasses identified variables and parameters generating quality data. While performing, scientists and engineers monitor and record progress. After performing, they evaluate to make changes to modify and repeat the investigation if necessary.
Content Limits	Tier 1 and 2 items should avoid the word “best” in the stem. Any necessary stimulus should be written with clear language following the rules for “plain language.” Any necessary stimulus text complexity should increase as the tiers increase. Tier 1 items should contain picture support in answer choices when possible to aid comprehension. Tier 2 items can contain picture support in answer choices. Tier 3 items should not contain picture support unless necessary. Tier 1 distractors should demonstrate clear misunderstanding of the concept or skill.

	Tier 2 distractors should be possible misunderstandings of the concept or skill.
Allowable Stimulus Material	N/A
Context	No context required
Recommended Response Mechanisms	Multiple Choice (MC) Multiple Select (MS) Table Match (TM)
Construct-Relevant Vocabulary	constraint, control, criteria, data, dependent variable, design, experiment, impact, independent variable, investigation, limitation, model, solution, variable
Cognitive Complexity	5
Evidence Statements	
Evidence Statements	**Tier 1** Students can list laboratory procedures that aid in investigations.
	Tier 2 Students can determine the best plan to gather quality data from an investigation.
	Tier 3 Students can identify a flaw in the investigation plan. Students can modify the investigation plan, where necessary, to yield better results.
Accessibility and Accommodation Considerations	
Stimulus Graphic Limitations	Stimulus graphics will be limited to clear photos, illustrations, diagrams, tables, and charts that directly relate to the passage topic. Information contained within stimulus graphics is ineligible for assessment unless specifically prescribed by Content Connector and/or evidence statements.
Linguistic Complexity	To be determined after IDOE review
Reference Tools	N/A

Sample Item	
Tier 1	Maria uses liquids in an investigation. Which item will help keep her clothes safe? A.  beaker (audio: a beaker) B.  lab coat **(audio: a lab coat)** C.  microscope (audio: a microscope)

Reporting Category	Using Models to Describe and Explain Structure, Function, and Processes
Content Connector	**SEPS.4:** Analyzing and interpreting data: Investigations produce data that must be analyzed in order to derive meaning. Because data patterns and trends are not always obvious, scientists and engineers use a range of tools to identify the significant features in the data. They identify sources of error in the investigations and calculate the degree of certainty in the results. Advances in science and engineering makes analysis of proposed solutions more efficient and effective. They analyze their results by continually asking themselves questions; possible questions may be, but are not limited to: “Does this make sense?” “Could my results be duplicated?” and/or “Does the design solve the problem with the given constraints?”
IAS Standard	**SEPS.4:** Analyzing and interpreting data: Investigations produce data that must be analyzed in order to derive meaning. Because data patterns and trends are not always obvious, scientists and engineers use a range of tools to identify the significant features in the data. They identify sources of error in the investigations and calculate the degree of certainty in the results. Advances in science and engineering makes analysis of proposed solutions more efficient and effective. They analyze their results by continually asking themselves questions; possible questions may be, but are not limited to: “Does this make sense?” “Could my results be duplicated?” and/or “Does the design solve the problem with the given constraints?”
Content Limits	Tier 1 and 2 items should avoid the word “best” in the stem. Any necessary stimulus should be written with clear language following the rules for “plain language.” Any necessary stimulus text complexity should increase as the tiers increase. Tier 1 items should contain picture support in answer choices when possible to aid comprehension. Tier 2 items can contain picture support in answer choices. Tier 3 items should not contain picture support unless necessary. Tier 1 distractors should demonstrate clear misunderstanding of the concept or skill. Tier 2 distractors should be possible misunderstandings of the concept or skill. Limit the amount of data provided on graphs to one data

	set. Use concrete models (no processes).
Allowable Stimulus Material	graphs; models
Context	No context required
Recommended Response Mechanisms	Multiple Choice (MC)
Construct-Relevant Vocabulary	constraint, control, criteria, data, dependent variable, design, error, experiment, impact, independent variable, investigation, limitation, solution, variable, outlier, models, validity
Cognitive Complexity	5
Evidence Statements	
Evidence Statements	**Tier 1** Students can identify an obvious outlier. Students can identify a claim based on a graph. Students can answer questions using a graph.
	Tier 2 Students can extrapolate a data point inside the data set. Using a graph, students can support or refute the validity of a claim. Students can identify whether a model represents a given scenario.
	Tier 3 Students can extrapolate a data point outside the data set. Students can identify limitations of a given model.
Accessibility and Accommodation Considerations	
Stimulus Graphic Limitations	Stimulus graphics will be limited to clear photos, illustrations, diagrams, tables, and charts that directly relate to the passage topic. Information contained within stimulus graphics is ineligible for assessment unless specifically prescribed by Content Connector and/or evidence statements.
Linguistic Complexity	To be determined after IDOE review
Reference Tools	N/A

Sample Item	
Tier 1	Here is a graph of a panda population.  Between which years did the panda population grow the most? A. Years 1-2 B. **Years 2-3** C. Years 3-4

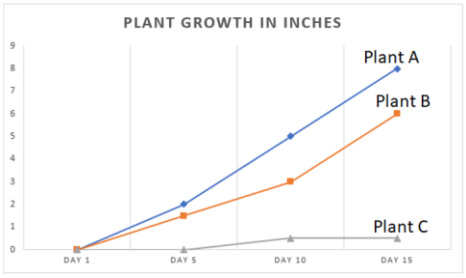
Reporting Category	Using Models to Describe and Explain Structure, Function, and Processes
Content Connector	**SEPS.5:** Using mathematics and computational thinking: In both science and engineering, mathematics and computation are fundamental tools for representing physical variables and their relationships. They are used for a range of tasks such as constructing simulations; solving equations exactly or approximately; and recognizing, expressing, and applying quantitative relationships. Mathematical and computational approaches enable scientists and engineers to predict the behavior of systems and test the validity of such predictions. Scientists and engineers understand how mathematical ideas interconnect and build on one another to produce a coherent whole.
IAS Standard	**SEPS.5:** Using mathematics and computational thinking: In both science and engineering, mathematics and computation are fundamental tools for representing physical variables and their relationships. They are used for a range of tasks such as constructing simulations; solving equations exactly or approximately; and recognizing, expressing, and applying quantitative relationships. Mathematical and computational approaches enable scientists and engineers to predict the behavior of systems and test the validity of such predictions. Scientists and engineers understand how mathematical ideas interconnect and build on one another to produce a coherent whole.
Content Limits	Tier 1 and 2 items should avoid the word “best” in the stem. Any necessary stimulus should be written with clear language following the rules for “plain language.” Any necessary stimulus text complexity should increase as the tiers increase. Tier 1 items should contain picture support in answer choices when possible to aid comprehension. Tier 2 items can contain picture support in answer choices. Tier 3 items should not contain picture support unless necessary. Tier 1 distractors should demonstrate clear misunderstanding of the concept or skill. Tier 2 distractors should be possible misunderstandings of the concept or skill. Use only whole numbers.

Allowable Stimulus Material	N/A
Context	No context required
Recommended Response Mechanisms	Multiple Choice (MC) Multiple Select (MS) Table Match (TM)
Construct-Relevant Vocabulary	constraint, control, criteria, data, dependent variable, design, experiment, impact, independent variable, investigation, limitation, quantitative, solution, trend, variable
Cognitive Complexity	5
Evidence Statements	
Evidence Statements	**Tier 1** Students can use a data table to answer questions.
	Tier 2 Students can identify a pattern in a data table.
	Tier 3 Students can compare two sets of numerical data to find a similar pattern.
Accessibility and Accommodation Considerations	
Stimulus Graphic Limitations	Stimulus graphics will be limited to clear photos, illustrations, diagrams, tables, and charts that directly relate to the passage topic. Information contained within stimulus graphics is ineligible for assessment unless specifically prescribed by Content Connector and/or evidence statements.
Linguistic Complexity	To be determined after IDOE review
Reference Tools	N/A

Sample Item	
Tier 2	The data table contains the average amount of rainfall for four months. Average Rainfall from 1980-2010 **Month** / **Average Rainfall (inches)** May – 5 June – 4 July – 5 August – 3 Which statement is supported by the data in the table? A. It rains only in July and August. B. It rains the least in May and August. C. **It rains the most in May and July.**

Reporting Category	Communicating Explanations and Evaluating Claims Using Evidence
Content Connector	**SEPS.6:** Constructing explanations and designing solutions: Scientists and engineers use their results from the investigation in constructing descriptions and explanations, citing the interpretation of data, connecting the investigation to how the natural and designed world(s) work. They construct or design logical coherent explanations or solutions of phenomena that incorporate their understanding of science and/or engineering or a model that represents it and are consistent with the available evidence.
IAS Standard	**SEPS.6:** Constructing explanations and designing solutions: Scientists and engineers use their results from the investigation in constructing descriptions and explanations, citing the interpretation of data, connecting the investigation to how the natural and designed world(s) work. They construct or design logical coherent explanations or solutions of phenomena that incorporate their understanding of science and/or engineering or a model that represents it and are consistent with the available evidence.
Content Limits	Tier 1 and 2 items should avoid the word “best” in the stem. Any necessary stimulus should be written with clear language following the rules for “plain language.” Any necessary stimulus text complexity should increase as the tiers increase. Tier 1 items should contain picture support in answer choices when possible to aid comprehension. Tier 2 items can contain picture support in answer choices. Tier 3 items should not contain picture support unless necessary. Tier 1 distractors should demonstrate clear misunderstanding of the concept or skill. Tier 2 distractors should be possible misunderstandings of the concept or skill. Limit to scientific data (not engineering). Limit evidence and data to the natural world.
Allowable Stimulus Material	graphs; charts; tables; graphics
Context	No context required

Recommended Response Mechanisms	Multiple Choice (MC) Multiple Select (MS) Table Match (TM)
Construct-Relevant Vocabulary	control, criteria, data, design, evidence, experiment, impact, investigation, limitation, rationale, representation, solution, variable, interpretation, logical
Cognitive Complexity	5
Evidence Statements	
Evidence Statements	**Tier 1** Students can identify whether results can be used as evidence.
	Tier 2 Students can use scientific evidence as the basis for the explanation of a scientific outcome.
	Tier 3 Students can identify an evidence-based claim from a scientific investigation.
Accessibility and Accommodation Considerations	
Stimulus Graphic Limitations	Stimulus graphics will be limited to clear photos, illustrations, diagrams, tables, and charts that directly relate to the passage topic. Information contained within stimulus graphics is ineligible for assessment unless specifically prescribed by Content Connector and/or evidence statements.
Linguistic Complexity	To be determined after IDOE review
Reference Tools	N/A

Sample Item	
Tier 3	Joe studied the effect of fertilizer on plant growth. He used three plants. Plant A was given fertilizer and water. Plant B was only given water. Plant C was not given fertilizer or water. Joe's data is on the graph.  Which statement is supported by the data chart? A. **The fertilizer helped Plant A grow more than Plant B.** B. The fertilizer helped Plant B grow more than Plant A. C. The fertilizer helped Plant C grow more than Plant B.

Reporting Category	Communicating Explanations and Evaluating Claims Using Evidence
Content Connector	**SEPS.7:** Engaging in argument from evidence: Scientists and engineers use reasoning and argument based on evidence to identify the best explanation for a natural phenomenon or the best solution to a design problem. Scientists and engineers use argumentation, the process by which evidence-based conclusions and solutions are reached, to listen to, compare, and evaluate competing ideas and methods based on merits. Scientists and engineers engage in argumentation when investigating a phenomenon, testing a design solution, resolving questions about measurements, building data models, and using evidence to evaluate claims.
IAS Standard	**SEPS.7:** Engaging in argument from evidence: Scientists and engineers use reasoning and argument based on evidence to identify the best explanation for a natural phenomenon or the best solution to a design problem. Scientists and engineers use argumentation, the process by which evidence-based conclusions and solutions are reached, to listen to, compare, and evaluate competing ideas and methods based on merits. Scientists and engineers engage in argumentation when investigating a phenomenon, testing a design solution, resolving questions about measurements, building data models, and using evidence to evaluate claims.
Content Limits	Tier 1 and 2 items should avoid the word “best” in the stem. Any necessary stimulus should be written with clear language following the rules for “plain language.” Any necessary stimulus text complexity should increase as the tiers increase. Tier 1 items should contain picture support in answer choices when possible to aid comprehension. Tier 2 items can contain picture support in answer choices. Tier 3 items should not contain picture support unless necessary. Tier 1 distractors should demonstrate clear misunderstanding of the concept or skill. Tier 2 distractors should be possible misunderstandings of the concept or skill. Limit evidence and data to the natural world. Limit to scientific data (not engineering).

Allowable Stimulus Material	N/A
Context	Required
Recommended Response Mechanisms	Multiple Choice (MC) Multiple Select (MS) Table Match (TM)
Construct-Relevant Vocabulary	argument, constraint, criteria, data, design, evidence, impact, representation, result, solution, cause and effect, opposing conclusion
Cognitive Complexity	5
Evidence Statements	
Evidence Statements	**Tier 1** Students can support a simple argument with evidence.
	Tier 2 Students can evaluate evidence supporting an argument and/or which argument in a set is supported by evidence. Students can compare and contrast simple opposing conclusions.
	Tier 3 Students can explain why an argument is not supported. Students can justify a conclusion with evidence. Students can analyze a cause-and-effect scenario supported by evidence.
Accessibility and Accommodation Considerations	
Stimulus Graphic Limitations	Stimulus graphics will be limited to clear photos, illustrations, diagrams, tables, and charts that directly relate to the passage topic. Information contained within stimulus graphics is ineligible for assessment unless specifically prescribed by Content Connector and/or evidence statements.
Linguistic Complexity	To be determined after IDOE review
Reference Tools	N/A

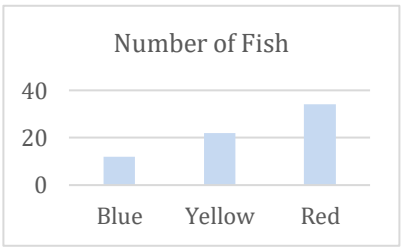
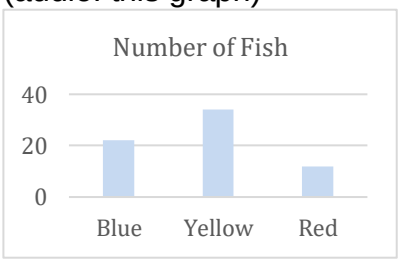
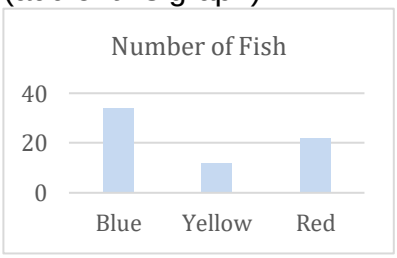
<table>
<tr><th colspan="2">Sample Item</th></tr>
<tr><td>Tier 1</td><td>
This table is used to sort some animals.
<table>
<tr><th colspan="2">How Animals Reproduce</th></tr>
<tr><th>Animals that Lay Eggs</th><th>Animals that do not Lay Eggs</th></tr>
<tr><td>Sea Turtle</td><td>Chimpanzee</td></tr>
<tr><td>Penguin</td><td>Tiger</td></tr>
</table>
Based on the chart, which animal lays eggs?
A. 
sea turtle
(audio: a sea turtle)

B. 
tiger
(audio: a tiger)

C. 
chimpanzee
(audio: a chimpanzee)
</td></tr>
</table>

Reporting Category	Communicating Explanations and Evaluating Claims Using Evidence
Content Connector	**SEPS.8:** Obtaining, evaluating, and communicating information: Scientists and engineers need to be communicating clearly and articulating the ideas and methods they generate. Critiquing and communicating ideas individually and in groups is a critical professional activity. Communicating information and ideas can be done in multiple ways: using tables, diagrams, graphs, models, and equations, as well as, orally, in writing, and through extended discussions. Scientists and engineers employ multiple sources to obtain information that is used to evaluate the merit and validity of claims, methods, and designs.
IAS Standard	**SEPS.8:** Obtaining, evaluating, and communicating information: Scientists and engineers need to be communicating clearly and articulating the ideas and methods they generate. Critiquing and communicating ideas individually and in groups is a critical professional activity. Communicating information and ideas can be done in multiple ways: using tables, diagrams, graphs, models, and equations, as well as, orally, in writing, and through extended discussions. Scientists and engineers employ multiple sources to obtain information that is used to evaluate the merit and validity of claims, methods, and designs.
Content Limits	Tier 1 and 2 items should avoid the word “best” in the stem. Any necessary stimulus should be written with clear language following the rules for “plain language.” Any necessary stimulus text complexity should increase as the tiers increase. Tier 1 items should contain picture support in answer choices when possible to aid comprehension. Tier 2 items can contain picture support in answer choices. Tier 3 items should not contain picture support unless necessary. Tier 1 distractors should demonstrate clear misunderstanding of the concept or skill. Tier 2 distractors should be possible misunderstandings of the concept or skill. For Tier 3, limit the number of sources to two. Do not assess validity or merit of sources.

	Do not include equations as a source.
Allowable Stimulus Material	tables; diagrams; graphs; models
Context	No context required
Recommended Response Mechanisms	Multiple Choice (MC) Multiple Select (MS) Table Match (TM)
Construct-Relevant Vocabulary	bias, constraint, control, credible, criteria, data, design, error, impact, repetition, solution
Cognitive Complexity	4
Evidence Statements	
Evidence Statements	**Tier 1** Students can identify mechanisms by which scientists communicate ideas.
	Tier 2 Students can identify when an experiment fails. Students can communicate findings (e.g., text, tables, diagrams, graphs, models) from a scientific investigation.
	Tier 3 Students can identify corrective action for a failed experiment. Students can compare the credibility of information from two different sources.
Accessibility and Accommodation Considerations	
Stimulus Graphic Limitations	Stimulus graphics will be limited to clear photos, illustrations, diagrams, tables, and charts that directly relate to the passage topic. Information contained within stimulus graphics is ineligible for assessment unless specifically prescribed by Content Connector and/or evidence statements.
Linguistic Complexity	To be determined after IDOE review
Reference Tools	N/A

Sample Item	
Tier 2	A scientist counts the number of fish that are found in a lake. ▪ 34 blue fish ▪ 12 yellow fish ▪ 22 red fish Which graph correctly displays the scientist's findings? A.  (audio: this graph) B.  (audio: this graph) C.  **(audio: this graph)**