

Anatomy & Physiology

Curriculum/Content Area: Science	Course Length: 2 Terms
Course Title: Anatomy & Physiology	Date last reviewed: March 2018
Prerequisites: Biology or Honors Biology	Board approval date: May 2018
Primary Resource:	

Desired Results

Course description and purpose:

Anatomy and Physiology is an advanced level biology course designed to help prepare students for a career in medicine, health or other science fields. The curriculum is focused on human body systems along with their specific structures and functions, interactions and cellular components.

<p>Enduring Understandings (EUs):</p> <ol style="list-style-type: none"> Patterns: Observed patterns in nature guide organization and classification and prompt questions about relationships and causes underlying them. Cause and Effect: Events have causes, sometimes simple, sometimes multifaceted. Deciphering causal relationships, and the mechanisms by which they are mediated, is a major activity of science and engineering. Scale, Proportion, and Quantity: In considering phenomena, it is critical to recognize what is relevant at different size, time, and energy scales, and to recognize proportional relationships between different quantities as scales change. 	<p>Essential Questions (EQs):</p> <ol style="list-style-type: none"> How is medical terminology applied to the human body? How is the body designed to support efficient functions of all system? What are the structural components and functions of epithelial, connective, muscle and nervous tissues? How are the structures of skin connected to its function and how can they be disrupted? What is the structure and function of the skeletal system? What are the different types of skeletal joints? How do common skeletal disorders affect the skeletal system?
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4. **Systems and System Models:** A system is an organized group of related objects or components; models can be used for understanding and predicting the behavior of systems.
5. **Energy and Matter:** Tracking energy and matter flows, into, out of, and within systems helps one understand their system's behavior.
6. **Structure and Function:** The way an object is shaped or structured determines many of its properties and functions.
7. **Stability and Change:** For both designed and natural systems, conditions that affect stability and factors that control rates of change are critical elements to consider and understand.

8. What is the structure and function of the muscular system?
9. How and why do muscles contract?
10. How does the structure of a neuron affect function?
11. What role does the central system have in maintaining homeostasis?
12. How does blood flow through the heart?
13. What is the difference between veins and arteries?
14. What is the function of the respiratory system?
15. What happens when homeostasis is not maintained?
16. How are the respiratory system and circulatory system connected?
17. Why is the endocrine system important?
18. How does the endocrine system work with the nervous system?
19. What are the primary functions of our digestive system?
20. What is the path of food through the digestive system?
21. How do the various digestive organs contribute to the process of digestion?
22. What is the structure and function of the lymphatic system?
23. What is the difference between specific and nonspecific immunity?

Unit 1: Introduction to Anatomy and Physiology

Essential Questions:

1. How is medical terminology applied to the human body?
2. How is the body designed to support efficient functions of all system?

Topics:

1. Medical and anatomical terminology
 - Regions
 - Planes
 - Directional terms
 - Cavities
2. Systems overview
3. Homeostasis/Feedback loops

Standards:

Cross-Cutting Concepts:

1. **Systems and System Models** - Models (e.g., physical, mathematical, computer models) can be used to simulate systems and interactions—including energy, matter, and information flows—within and between systems at different scales. (HS-LS1-2)
2. **Stability and Change** - Feedback (negative or positive) can stabilize or destabilize a system. (HS-LS1-3)

Science and Engineering Practices

1. **Developing and Using Models** - Modeling in 9–12 builds on K–8 experiences and progresses to using, synthesizing, and developing models to predict and show relationships among variables between systems and their components in the natural and designed worlds. Develop and use a model based on evidence to illustrate the relationships between systems or between components of a system. (HS-LS1-2)
2. **Planning and Carrying Out Investigations** - Planning and carrying out investigations in 9-12 builds on K-8 experiences and progresses to include investigations that provide evidence for and test conceptual, mathematical, physical, and empirical models. Plan and conduct an investigation individually and collaboratively to produce data to serve as the basis for evidence, and in the design: decide on types, how much, and accuracy of data needed to produce reliable measurements and consider limitations on the precision of the data (e.g., number of trials, cost, risk, time), and refine the design accordingly. (HS-LS1-3)

Disciplinary Core Ideas

1. **LS1.A: Structure and Function**
 - a. Multicellular organisms have a hierarchical structural organization, in which any one system is made up of numerous parts and is itself a component of the

next level. b

2. LS1.A: Structure and Function

- a. Feedback mechanisms maintain a living system's internal conditions within certain limits and mediate behaviors, allowing it to remain alive and functional even as external conditions change within some range. Feedback mechanisms can encourage (through positive feedback) or discourage (negative feedback) what is going on inside the living system. (HS-LS1-3)

NGSS Performance Expectations (Derived from standards above)

HS-LS1-2. Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms.

HS-LS1-3. Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis.

Learning Targets:

1. I can distinguish between anatomy and physiology and identify several branches of each. (HS-LS1-2)
2. I can describe the organization of the human body with regard to systems. (HS-LS1-2)
3. I can define homeostasis and explain its importance to normal human functioning. (HS-LS1-3)
4. I can use appropriate anatomical terminology to identify key body structures, body regions, and directions in the body. (HS-LS1-2)

Assessment Evidence:

Performance Assessment Options

May include, but are not limited to the following:

Inquiry-based laboratory experiments, individual and group collaboration projects and group case study discussions.

Other assessment options

May include, but are not limited to the following:

Building level common formative and summative assessments aligned to learning targets

Unit 2: Cell Structure and Function Characteristics of Tissues

Essential Questions:

1. What are the structural components and functions of epithelial, connective, muscle and nervous tissues?

Topics:

1. Stem cell differentiation
2. Structure and function of epithelial, connective, muscles, neural tissues

Standards:

Cross Cutting Concepts

1. **Systems and System Models Models** - Models(e.g., physical, mathematical, computer models) can be used to simulate systems and interactions—including energy, matter, and information flows—within and between systems at different scales. (HS-LS1-2) & (HS-LS1-4.)

Science and Engineering Practices

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Disciplinary Core Ideas

1. **LS1.A: Structure and Function**
 - a. Multicellular organisms have a hierarchical structural organization, in which any one system is made up of numerous parts and is itself a component of the next level. (HS-LS1-2)
2. **LS1.B: Growth and Development of Organisms**
 - a. In multicellular organisms individual cells grow and then divide via a process called mitosis, thereby allowing the organism to grow. The organism begins as a single cell (fertilized egg) that divides successively to produce many cells, with each parent cell passing identical genetic material (two variants of each chromosome pair) to both daughter cells. Cellular division and differentiation produce and maintain a complex organism, composed of systems of tissues and organs that work together to meet the needs of the whole organism. (HS-LS1-4.)

NGSS Performance Expectations (Derived from standards above)

HS-LS1-2. Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms.
HS-LS1-4. Use a model to illustrate the role of cellular division and differentiation in producing and maintaining complex organisms.

Learning Targets:

1. I can explain how cells differentiate. (HS-LS1-4)
2. I can identify and explain the structure and function of epithelial tissues. (HS-LS1-2, 4)
3. I can identify and explain the structure and function of connective tissues. (HS-LS1-2, 4)
4. I can identify and explain the structure and function of muscle tissues. (HS-LS1-2, 4)
5. I can identify and explain the structure and function of neural tissues. (HS-LS1-2, 4)

Assessment Evidence:

Performance Assessment Options

May include, but are not limited to the following:

Inquiry-based laboratory experiments, individual and group collaboration projects and group case study discussions.

Other assessment options

May include, but are not limited to the following:

Building level common formative and summative assessments aligned to learning targets

Unit 3: Integumentary System

Essential Questions:

1. How are the structures of skin connected to its function and how can they be disrupted?

Unit Outline

1. Structure and function of the epidermis, dermis, subcutaneous
 - a. Accessory structures within epidermis
2. Skin cancer
3. Effects of aging on skin (thermoregulation)

Standards:

Cross Cutting Concepts

1. **Systems and System Models** - Models (e.g., physical, mathematical, computer models) can be used to simulate systems and interactions—including energy, matter, and information flows—within and between systems at different scales. (HS-LS1-2) & (HS-LS1-4.)

Science and Engineering Practices

1. **Developing and Using Models** - Modeling in 9–12 builds on K–8 experiences and progresses to using, synthesizing, and developing models to predict and show relationships among variables between systems and their components in the natural and designed worlds. Develop and use a model based on evidence to illustrate the relationships between systems or between components of a system. (HS-LS1-2) & (HS-LS1-4.)

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2. **LS1.B: Growth and Development of Organisms**
 - a. In multicellular organisms individual cells grow and then divide via a process called mitosis, thereby allowing the organism to grow. The organism begins as a single cell (fertilized egg) that divides successively to produce many cells, with each parent cell passing identical genetic material (two variants of each chromosome pair) to both daughter cells. Cellular division and differentiation produce and maintain a complex organism, composed of systems of tissues and organs that work together to meet the needs of the whole organism. (HS-LS1-4.)

NGSS Performance Expectations (Derived from standards above)

[HS-LS1-2](#). Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms.

[HS-LS1-4](#). Use a model to illustrate the role of cellular division and differentiation in producing and maintaining complex organisms.

Learning Targets:

1. I can describe the main structural features of the epidermis, dermis and subcutaneous layers and explain their functional significance.(HS-LS1-2, 4)
2. I can explain the damaging effects that can occur within the integumentary system. (HS-LS1-2)

Assessment Evidence:

Performance Assessment Options

May include, but are not limited to the following:

Inquiry-based laboratory experiments, individual and group collaboration projects and group case study discussions.

Other assessment options

May include, but are not limited to the following:

Building level common formative and summative assessments aligned to learning targets

Unit 4: Skeletal System

Essential Questions:

1. What is the structure and function of the skeletal system?
2. What are the different types of skeletal joints?
3. How do common skeletal disorders affect the skeletal system?

Topics:

1. Structure and function of bone
2. Long bone anatomy
3. Types of bones
4. Structure of bone tissue
5. Fractures (types & causes)
6. Axial vs appendicular (bone identification)
7. Structural and functional classification of body joints
8. Disorders

Standards

Cross Cutting Concepts

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Science and Engineering Practices

1. **Developing and Using Models** - Modeling in 9–12 builds on K–8 experiences and progresses to using, synthesizing, and developing models to predict and show relationships among variables between systems and their components in the natural and designed worlds. Develop and use a model based on evidence to illustrate the relationships between systems or between components of a system. (HS-LS1-2)

Disciplinary Core Ideas

1. **LS1.A: Structure and Function**
 - a. Multicellular organisms have a hierarchical structural organization, in which any one system is made up of numerous parts and is itself a component of the next level. (HS-LS1-2)

NGSS Performance Expectations (Derived from standards above)

[HS-LS1-2](#). Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms.

Learning Targets:

1. I can describe the general structure and function of bone tissue. (HS-LS1-2)
2. I can identify the major anatomical areas of a long bone. (HS-LS1-2)
3. I can name and describe the various types of fractures. (HS-LS1-2)
4. I can differentiate between the axial and appendicular skeleton. (HS-LS1-2)
5. I can compare and contrast the structural and functional classifications of skeletal joints. (HS-LS1-2)
6. I can explain abnormal bone anatomy and physiology. (HS-LS1-2)

Assessment Evidence:

Performance Assessment Options

May include, but are not limited to the following:

Inquiry-based laboratory experiments, individual and group collaboration projects and group case study discussions.

Other assessment options

May include, but are not limited to the following:

Building level common formative and summative assessments aligned to learning targets

Unit 5: Muscular System

Essential Questions:

1. What is the structure and function of the muscular system?
2. How and why do muscles contract?

Topics:

1. Structure and function of muscle tissue
2. Muscle contraction (sliding filament theory and neuromuscular junction)
3. Origin, insertion, action of common muscles

Standards:

Cross Cutting Concepts

1. **Systems and System Models** - Models (e.g., physical, mathematical, computer models) can be used to simulate systems and interactions—including energy, matter, and information flows—within and between systems at different scales. (HS-LS1-2)

Science and Engineering Practices

1. **Developing and Using Models** - Modeling in 9–12 builds on K–8 experiences and progresses to using, synthesizing, and developing models to predict and show relationships among variables between systems and their components in the natural and designed worlds. Develop and use a model based on evidence to illustrate the relationships between systems or between components of a system. (HS-LS1-2)

Disciplinary Core Ideas

1. **LS1.A: Structure and Function**
 - a. Multicellular organisms have a hierarchical structural organization, in which any one system is made up of numerous parts and is itself a component of the next level. (HS-LS1-2)

NGSS Performance Expectations (Derived from standards above)

HS-LS1-2. Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms.

Learning Targets:

1. I can identify and explain the physiology of muscle tissue. (HS-LS1-2)
2. I can explain the major events of skeletal muscle fiber contraction. (HS-LS1-2)
3. I can provide origin, insertion, action of major skeletal muscles. (HS-LS1-2)

Assessment Evidence:

Performance Assessment Options

Other assessment options

May include, but are not limited to the following:

Inquiry-based laboratory experiments,
individual and group collaboration projects
and group case study discussions.

May include, but are not limited to the following:

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summative assessments aligned to learning
targets

Unit 6: Nervous System

Essential Questions:

1. How does the structure of a neuron affect function?
2. What role does the central system have in maintaining homeostasis?

Topics:

1. Cells types
2. Action potential
3. Central vs peripheral systems
4. Functional division (sympathetic vs parasympathetic)
5. Abnormalities (TBI's, drug use)

Standards

Cross Cutting Concepts

1. **Systems and System Models** - Models (e.g., physical, mathematical, computer models) can be used to simulate systems and interactions—including energy, matter, and information flows—within and between systems at different scales. (HS-LS1-2)

Science and Engineering Practices

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Disciplinary Core Ideas

1. **LS1.A: Structure and Function**
 - a. Multicellular organisms have a hierarchical structural organization, in which any one system is made up of numerous parts and is itself a component of the next level. (HS-LS1-2)

NGSS Performance Expectations (Derived from standards above)

[HS-LS1-2](#). Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms.

Learning Targets:

1. I can identify and explain the different cells types in the nervous system. (HS-LS1-2)
2. I can describe an action potential. (HS-LS1-2)
3. I can differentiate between the structure and function of the central and peripheral nervous system. (HS-LS1-2)

4. I can identify the functional divisions of the nervous system. (HS-LS1-2)
5. I can explain abnormalities of the nervous system. (HS-LS1-2)

Assessment Evidence:

Performance Assessment Options

May include, but are not limited to the following:

Inquiry-based laboratory experiments, individual and group collaboration projects and group case study discussions.

Other assessment options

May include, but are not limited to the following:

Building level common formative and summative assessments aligned to learning targets

Unit 7: Cardiovascular/Respiratory System

Essential Questions:

1. How does blood flow through the heart?
2. What is the difference between veins and arteries?
3. What is the function of the respiratory system?
4. What happens when homeostasis is not maintained?
5. How are the respiratory system and circulatory system connected?

Topics:

1. Blood and blood typing
2. Structure of heart
3. Flow of blood
4. Conduction of heart
5. Blood pressure and homeostasis
6. Flow of air through respiratory system
7. Gas exchange
8. Breathing

Standards:

Cross Cutting Concepts

1. **Systems and System Models** - Models (e.g., physical, mathematical, computer models) can be used to simulate systems and interactions—including energy, matter, and information flows—within and between systems at different scales. (HS-LS1-2)
2. **Stability and Change** - Feedback (negative or positive) can stabilize or destabilize a system. (HS-LS1-3)

Science and Engineering Practices

1. **Developing and Using Models** - Modeling in 9–12 builds on K–8 experiences and progresses to using, synthesizing, and developing models to predict and show relationships among variables between systems and their components in the natural and designed worlds. Develop and use a model based on evidence to illustrate the relationships between systems or between components of a system. (HS-LS1-2)
2. **Planning and Carrying Out Investigations** - Planning and carrying out investigations in 9-12 builds on K-8 experiences and progresses to include investigations that provide evidence for and test conceptual, mathematical, physical, and empirical models. Plan and conduct an investigation individually and collaboratively to produce data to serve as the basis for evidence, and in the design: decide on types, how much, and accuracy of data needed to produce reliable measurements and consider limitations on the precision of the data (e.g., number of trials, cost, risk, time), and refine the design accordingly. (HS-LS1-3)
3. **Connections to Nature of Science** - Scientific Investigations Use a Variety of

Methods Scientific inquiry is characterized by a common set of values that include: logical thinking, precision, open-mindedness, objectivity, skepticism, replicability of results, and honest and ethical reporting of findings.

Disciplinary Core Ideas

1. LS1.A: Structure and Function

- a. Multicellular organisms have a hierarchical structural organization, in which any one system is made up of numerous parts and is itself a component of the next level. (HS-LS1-2)

2. LS1.A: Structure and Function

- a. Feedback mechanisms maintain a living system's internal conditions within certain limits and mediate behaviors, allowing it to remain alive and functional even as external conditions change within some range. Feedback mechanisms can encourage (through positive feedback) or discourage (negative feedback) what is going on inside the living system. (HS-LS1-3)

NGSS Performance Expectations (Derived from standards above)

[**HS-LS1-2.**](#) Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms.

[**HS-LS1-3.**](#) Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis.

Learning Targets:

1. I can describe the composition of whole blood. (HS-LS1-2, 3)
2. I can describe the ABO and Rh blood groups. (HS-LS1-2)
3. I can identify the anatomical structure of the heart. (HS-LS1-2)
4. I can trace the pathway of blood through the heart and body. (HS-LS1-2)
5. I can explain the cardiac cycle. (HS-LS1-2)
6. I can understand blood pressure and how it regulates homeostasis. (HS-LS1-2, 3)
7. I can describe the flow of air through the respiratory system. (HS-LS1-2)
8. I can explain how oxygen and carbon dioxide are transported in the blood. (HS-LS1-2)
9. I can understand how multiple systems interact to ensure continuous breathing. (HS-LS1-2, 3)

Assessment Evidence:

Performance Assessment Options

May include, but are not limited to the following:

Inquiry-based laboratory experiments, individual and group collaboration projects and group case study discussions.

Other assessment options

May include, but are not limited to the following:

Building level common formative and summative assessments aligned to learning targets

Unit 8: Endocrine System

Essential Questions:

1. Why is the endocrine system important?
2. How does the endocrine system work with the nervous system?

Topics:

1. Peptide and steroid hormones
2. Location of glands
3. Target, source and action of hormones
4. Homeostasis

Standards:

Cross Cutting Concepts

1. **Systems and System Models** - Models (e.g., physical, mathematical, computer models) can be used to simulate systems and interactions—including energy, matter, and information flows—within and between systems at different scales. (HS-LS1-2)

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1. **Developing and Using Models** - Modeling in 9–12 builds on K–8 experiences and progresses to using, synthesizing, and developing models to predict and show relationships among variables between systems and their components in the natural and designed worlds. Develop and use a model based on evidence to illustrate the relationships between systems or between components of a system. (HS-LS1-2)

Disciplinary Core Ideas

1. **LS1.A: Structure and Function**
 - a. Multicellular organisms have a hierarchical structural organization, in which any one system is made up of numerous parts and is itself a component of the next level. (HS-LS1-2)

NGSS Performance Expectations (Derived from standards above)

[HS-LS1-2](#). Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms.

[HS-LS1-3](#). Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis.

Learning Targets:

1. I can compare the chemical classes of hormones. (HS-LS1-2)
1. I can describe the location and structure of each of the main endocrine glands. (HS-LS1-2)

2. I can identify the hormones produced by each endocrine gland and describe their effects. (HS-LS1-2, 3)
3. I can explain how the endocrine system helps maintain homeostasis. (HS-LS1-3)

Assessment Evidence:

Performance Assessment Options

May include, but are not limited to the following:

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Other assessment options

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Building level common formative and summative assessments aligned to learning targets

Unit 9: Digestive System

Essential Questions:

1. What are the primary functions of our digestive system?
2. What is the path of food through the digestive system?

How do the various digestive organs contribute to the process of digestion?

Topics:

1. Digestive tract and accessory organs
2. Function of digestive systems
3. Digestion/enzyme for macromolecules

Standards:

Cross Cutting Concepts

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Disciplinary Core Ideas

1. **LS1.A: Structure and Function**
 - a. Multicellular organisms have a hierarchical structural organization, in which any one system is made up of numerous parts and is itself a component of the next level. (HS-LS1-2)

NGSS Performance Expectations (Derived from standards above)

HS-LS1-2. Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms.

Learning Targets:

1. I can identify the organs of the digestive tract and the accessory organs of digestion. (HS-LS1-2)
2. I can list the functions of the digestive system. (HS-LS1-2)
3. I can describe the digestion and absorption of carbohydrates, lipids, and proteins.

(HS-LS1-2)

Assessment Evidence:

Performance Assessment Options

May include, but are not limited to the following:

Inquiry-based laboratory experiments, individual and group collaboration projects and group case study discussions.

Other assessment options

May include, but are not limited to the following:

Building level common formative and summative assessments aligned to learning targets

Unit 10: Lymphatic/Immune System

Essential Questions:

1. What is the structure and function of the lymphatic system?
2. What is the difference between specific and nonspecific immunity?

Topics:

1. Structure and function of lymph organ
2. Structure and function of lymphocytes
3. Specific and nonspecific immune response

Standards:

Cross Cutting Concepts

1. **Systems and System Models** - Models (e.g., physical, mathematical, computer models) can be used to simulate systems and interactions—including energy, matter, and information flows—within and between systems at different scales. (HS-LS1-2)
2. **Stability and Change** - Feedback (negative or positive) can stabilize or destabilize a system. (HS-LS1-3)

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3. **Connections to Nature of Science - Scientific Investigations Use a Variety of Methods** Scientific inquiry is characterized by a common set of values that include: logical thinking, precision, open-mindedness, objectivity, skepticism, replicability of results, and honest and ethical reporting of findings.

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2. LS1.A: Structure and Function

- a. Feedback mechanisms maintain a living system’s internal conditions within certain limits and mediate behaviors, allowing it to remain alive and functional even as external conditions change within some range. Feedback mechanisms can encourage (through positive feedback) or discourage (negative feedback) what is going on inside the living system. (HS-LS1-3)

NGSS Performance Expectations (Derived from standards above)

[HS-LS1-2](#). Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms.
[HS-LS1-3](#). Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis.

Learning Targets:

1. I can describe the structure and function of lymphatic vessels, lymph nodes, thymus and spleen. (HS-LS1-2)
2. I can compare and contrast lymphocytes. (HS-LS1-2)
3. I can distinguish between specific and nonspecific immune responses. (HS-LS1-2, 3)

Assessment Evidence:

Performance Assessment Options

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Other assessment options

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