

Selected Response Section

Question	Version 1	Version 2	Version 3	Version 4	Version 5	Version 6
1	B	A	B	C	D	D
2	A	A	C	D	B	D
3	C	C	D	D	D	D
4	C	C	A	D	B	C
5	B	A	D	D	A	A
6	D	C	A	A	A	C
7	B	C	B	D	B	B
8	C	A	B	C	C	A
9	C	A	B	B	D	A
10	A	D	B	A	C	B
11	D	B	D	B	D	C
12	A	C	A	C	C	C
13	A	B	D	C	B	A
14	B	B	B	A	B	D
15	B	B	B	A	D	B
16	C	A	D	D	B	A
17	D	A	D	B	C	A
18	A	B	A	D	C	D
19	C	A	B	C	D	A
20	D	A	D	B	C	A

OPEN RESPONSE SCORING

This document includes benchmark answers to guide the scoring of the open response items on the *Life Science* DTAMS assessments. These are items numbered 21 – 25, each with part (a) and part (b).

Part (a) is scored on a scale from 0 – 1

Part (b) is scored on a scale from 0 – 2

This document includes general guidelines on the scoring rubric as well as specific benchmark answers to operationalize and illustrate the application of the guidelines with specific answers. These benchmark answers are actual answers from the initial round of field testing the assessments. Commentary after many of the benchmark answers is included describing the rationale for why particular benchmark answers received particular scores.

Also included immediately after each question are several paragraphs of background science content information to ensure scorers have a solid grasp of the relevant science so that they can better assess testtaker answers that fall outside the scope of this selected list of benchmark answers. This background information is written in lay terms with the goal of conveying the underlying concepts to scorers who may not have a strong content background in a particular area.

General Guidelines

This section provides an overview of the scoring rubric in general terms.

Part (a) 1 point for correct responses appropriately including keywords or phrases specifically related to the misconception. See sections below for lists of terms to look for with each question. If keywords or phrases are not appropriate, a point is still awarded for an accurate description of the central concept(s) at the core of the student misconception.

Part (b) 1 point each, up to 2 points total for responses which:

- Actively engage students in exploring concepts related to the topic. Which concepts are appropriately related to the topic is a function of each different item, requiring judgment calls informed by the benchmarks or criteria in the specific rubric of each question. Must have both parts (*active engagement, related*) for this 1 point. Active engagement might include: investigation, experiment, laboratory, demonstration with discussion, use analogy or metaphor, provocative questioning. The answer must provide enough details to judge this quality of “active engagement” as opposed to passive student listening or watching in order to earn this point. The degree of *how related to the topic* is more fully informed from the specific benchmark answers provided.
- Specifically target the misconception rather than teaching a more general concept.

General Decision Rules

A number of issues that arise somewhat frequently are addressed in this section. These decision rules reflect the consensus of the test development group and are applicable for all content areas. They apply across both parts (a) and (b) of the open response questions.

1. Incorrect terminology* doesn't automatically preclude earning points if the underlying concept is correct (e.g., referring to North & South poles as "charges" or misusing "velocity" instead of "energy") and the misuse is not directly targeting the intended content understanding.

**Terminology misuse that indicates lack of the targeted knowledge would earn ZERO. The context of the question and particular terminology misused is central to determining the relevance of the misuse.*

PART (a)

2. If part (a) makes 2 or more statements, ONE of which is right and the other which is scientifically wrong, score that as a ZERO if the incorrect statement contradicts the correct answer. Otherwise, the correct answer overrides the incorrect and scores a ONE.
3. Simply stating a law (e.g., Conservation of Energy or Newton's 1st Law) is not enough to earn a point – the response must describe the application of that law in the context of the question's scenario.

PART (b)

4. If the answer in part (b) indicates knowledge asked for in part (a), then go back and give part (a) credit even if the answer written in part (a) isn't satisfactory or even if (a) is blank, with the exception if part (a) directly contradicts the correct answer.

Comment: The most difficult part of the scoring guide seems to be that, for 1 point out of 2 in part (b), the problem is identifying if the experiment or demo etc. is relevant enough to earn a point. It is relatively easy to judge "active engagement" and relatively easy to judge "specifically target the misconception." Use the specific benchmark answers for guidance on what is "relevant enough."

NOTE: The specific questions used in the scoring guide below are from version 1 of the assessment, but similar concepts underlie the other parallel versions.

21. Several students state that since the Eastern Greenviolet's green flowers are similar in color to the plant's leaves, they must have the same function.
- a. Please describe the currently acceptable scientific explanation of the phenomenon that the students are not understanding. See directions at the beginning of the open response section for more detailed directions.

Misconceptions for this item:

Students are confusing structure (in this case, the color green) with function (function of flowers vs. function of leaves).

PART (a): Benchmark answers receiving 1 point:

Core concepts to express: Response should indicate that the function of flowers is generally to attract appropriate animals who would help pollinate, a key reproductive function. A bright color, such as green flowers, can be effective for attracting pollinators. That should be contrasted with the function of leaves, in particular the chloroplasts which are responsible for the green color of leaves, which have the function of photosynthesis so that the plant can produce the food it needs to survive.

The students are confusing the same color to mean those parts of the plant do the same thing. Flowers are for attracting pollinators, and being bright can help with that. Leaves are green because of the chlorophyll in them which helps with photosynthesis.

Clear distinction of the color from the different functions of those two plant parts is described.

PART (a): Benchmark answers receiving 0 points:

Students are confusing the name "Greenviolet" with the leaves, which are only part of the plant and not the whole plant. The function of the leaves is to make food for the plant, but the name is just what we call it.

References to the name of the plant are irrelevant to the misconception, and the description of photosynthesis is incomplete without reference to the key features the students were highlighting, the green color of the leaves.

- 21b. Explain how you would address this misconception using best instructional practices. See directions at the beginning of the open response section for more detailed directions.

Active engagement for this response might include:

Students experimenting with the function of leaves by covering some leaves (e.g. with tin foil) and leaving others open with both sets in sunlight. After a few days, check on the leaves and students will notice the green color leaving (turning yellow or brown, for example) as that part of the leaf dies without access to sunlight to photosynthesize. Do same with green flower – no impact on the flower by being covered. Students use this as evidence to describe that leaves need sunlight and the green color is from the components in the leaf (use chloroplasts term if they know it) that use sunlight to stay alive. For the flower function, students can watch videos of various animals pollinating plants with bright flowers but mostly ignoring those without – and infer the function of flowers from that evidence.

Follow-up discussion should emphasize for students that sometimes similar structures (in this case, color) don't always mean the same function, and that it is important to explore the linkage between structure and function when studying living things.

PART (b): Benchmark answers receiving 2 points:

[Active engagement of students as described above to investigate, collect evidence, and communicate orally or written form about the different functions of flowers and leaves for a plant. Need to have students explore both plant parts and their functions for the full 2 points.]

PART (b): Benchmark answers receiving 1 point:

[Earn 1 point if students only investigate the function of only one part of the plant, either the flower OR the leaf.]

OR

[Earn 1 point if students are directed to explore the function of different (not flower or leaf) parts of a plant – e.g. roots. If done in actively engaging manner, this is relevant and can help students think about structure/function broadly, but would not get both points because it didn't directly target the misconception expressed by the students.]

PART (b): Benchmark answers receiving 0 points:

[Earn 0 points if the students are not actively engaged – for example if the teacher simply tells them about function of flowers and leaves, and then does not raise issue of structure/function connections.

Any response that is trivially non-specific would also earn a zero, e.g. “*watch a video*” or “*do research on the internet*” are both too vague.

22. A student lamented that she accidentally killed her mom’s prize rose bush. She was making homemade ice cream in a churn containing salted ice. She decided to give the plant a drink on the hot summer day and dumped the salt-ice mixture from the churn near the base of the rose bush. She said that the ice caused the bush to wilt and die.
- a. Please describe the currently acceptable scientific explanation of the phenomenon that the students are not understanding.

Misconceptions for this item:

PART (a): Benchmark answers receiving 1 point:

Core concepts to express:

Example 1

Rationale

PART (a): Benchmark answers receiving 0 points:

Example 2

Rationale

22b. Explain how you would address this misconception using best instructional practices. See directions at the beginning of the open response section for more detailed directions.

Active engagement for this response might include:

PART (b): Benchmark answers receiving 2 points:

[describe conditions for 2 points, using ‘active engagement’ above as starting point]

PART (b): Benchmark answers receiving 1 point:

[describe way(s) in which 1 point might be earned]

OR

[Second way to earn 1 point]

PART (b): Benchmark answers receiving 0 points:

[describe how to earn 0 points that are non-trivial, i.e. what are some common responses that take an honest stab at the answer but fall short. No need to include trivially bad responses such as blank or extremely short and vague like, “watch a video”]

Any response that is trivially non-specific would also earn a zero, e.g. “*watch a video*” or “*do research on the internet*” are both too vague.

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|---|
| 23. A student tells you that his grandmother was just diagnosed with skin cancer. He said she has some type of tumor cells that are invading her normal cells. The class asks this student if he is frightened to touch her because they heard that skin cancer cells could quickly invade his cells by touching the affected area. |
| a. Please describe the <u>currently acceptable scientific explanation of the phenomenon</u> that the students are not understanding. |

Misconceptions for this item:

PART (a): Benchmark answers receiving 1 point:

Core concepts to express:

Example 1

Rationale

PART (a): Benchmark answers receiving 0 points:

Example 2

Rationale

- | |
|--|
| 23b. Explain how you would address this misconception using <u>best instructional practices</u> . See directions at the beginning of the open response section for more detailed directions. |
|--|

Active engagement for this response might include:

PART (b): Benchmark answers receiving 2 points:

[describe conditions for 2 points, using ‘active engagement’ above as starting point]

PART (b): Benchmark answers receiving 1 point:

[describe way(s) in which 1 point might be earned]

OR

[Second way to earn 1 point]

PART (b): Benchmark answers receiving 0 points:

[describe how to earn 0 points that are non-trivial, i.e. what are some common responses that take an honest stab at the answer but fall short. No need to include trivially bad responses such as blank or extremely short and vague like, “watch a video”]

Any response that is trivially non-specific would also earn a zero, e.g. “*watch a video*” or “*do research on the internet*” are both too vague.

24. While on a field trip with your class, your students look at a waterfall and say, “this is a good example of the water cycle. The water that falls into the pool evaporates and becomes rain that falls on top of the waterfall. That same water then flows down the waterfall again.”
- a. Please describe the currently acceptable scientific explanation of the phenomenon that the students are not understanding.

Misconceptions for this item:

PART (a): Benchmark answers receiving 1 point:

Core concepts to express:

Example 1

Rationale

PART (a): Benchmark answers receiving 0 points:

Example 2

Rationale

24b. Explain how you would address this misconception using best instructional practices. See directions at the beginning of the open response section for more detailed directions.

Active engagement for this response might include:

PART (b): Benchmark answers receiving 2 points:

[describe conditions for 2 points, using ‘active engagement’ above as starting point]

PART (b): Benchmark answers receiving 1 point:

[describe way(s) in which 1 point might be earned]

OR

[Second way to earn 1 point]

PART (b): Benchmark answers receiving 0 points:

[describe how to earn 0 points that are non-trivial, i.e. what are some common responses that take an honest stab at the answer but fall short. No need to include trivially bad responses such as blank or extremely short and vague like, “watch a video”]

Any response that is trivially non-specific would also earn a zero, e.g. “*watch a video*” or “*do research on the internet*” are both too vague.

25. A recent movie portrays people who have mutations. Students discuss the movie in class and agree that mutations are dangerous.
- a. Please describe the currently acceptable scientific explanation of the phenomenon that the students are not understanding.

Misconceptions for this item:

PART (a): Benchmark answers receiving 1 point:

Core concepts to express:

Example 1

Rationale

PART (a): Benchmark answers receiving 0 points:

Example 2

Rationale

25b. Explain how you would address this misconception using best instructional practices. See directions at the beginning of the open response section for more detailed directions.

Active engagement for this response might include:

PART (b): Benchmark answers receiving 2 points:

[describe conditions for 2 points, using 'active engagement' above as starting point]

PART (b): Benchmark answers receiving 1 point:

[describe way(s) in which 1 point might be earned]

OR

[Second way to earn 1 point]

PART (b): Benchmark answers receiving 0 points:

[describe how to earn 0 points that are non-trivial, i.e. what are some common responses that take an honest stab at the answer but fall short. No need to include trivially bad responses such as blank or extremely short and vague like, “watch a video”]

Any response that is trivially non-specific would also earn a zero, e.g. “*watch a video*” or “*do research on the internet*” are both too vague.