2024 MCAS Informational Webinar on Scoring Constructed-Responses

Sample Constructed-Response Item Training Pack

High School Biology
Chicken Combs

This item has three parts.

The comb on the top of a chicken's head may be full size, intermediate size, or small size. The small-size comb is called a pea comb. A chicken with a pea comb is shown.

Part A

The allele for a full-size comb **(H)** and the allele for the pea comb **(h)** show incomplete dominance.

Using allele symbols, identify the genotype of a chicken with a pea comb.

Part B

Chickens with pea combs have an advantage in cold climates because the pea comb reduces the amount of heat loss the chicken experiences.

Describe how the frequencies of the **H** allele and the **h** allele are expected to compare in a wild chicken population that lives in a cold climate.

Part C

Explain how the allele frequencies you described in Part B could be produced as a result of natural selection.

Scoring Guide

Score	Description
4	The response demonstrates a thorough understanding of inheritance patterns. The response correctly identifies the genotype of a chicken with a pea comb, clearly describes the expected frequencies of the alleles in a chicken population that lives in a cold climate, and clearly explains how these frequencies would be produced as a result of natural selection.
3	The response demonstrates a general understanding of inheritance patterns.
2	The response demonstrates a limited understanding of inheritance patterns.
1	The response demonstrates a minimal understanding of inheritance patterns.
0	The response is incorrect or contains some correct work that is irrelevant to the skill or concept being measured.
Blank	No response.

Scoring Notes

Part A (1 point)

hh

Part B (1 point)

The frequency of the **h** allele should be higher [than the frequency of the **H** allele].

Part C (2 points)

Because chickens with a pea comb **(hh)** have an advantage/lose less heat in cold environments, they would survive, reproduce, and pass on their genes/traits more frequently than chickens with intermediate or full-size combs.
OR
Because chickens with intermediate and full size combs (**Hh** and **HH**) have a disadvantage/lose more heat in cold environments, they would survive, reproduce, and pass on their genes/traits less frequently than chickens with pea combs.

Notes: To receive full credit for Part C response must address (1) the chickens with a pea comb have a survival advantage, and (2) the chickens with pea combs reproduce and pass on their genes/traits to their offspring.

For scores of 4, response must explicitly address passing on of genes/traits. At scores of 3 and below, response can simply mention increased rates of survival and reproduction.

Anchor Set of Student Responses (with scores)

Chicken Combs

Anchor Score 4

Part A

The allele for a full-size comb **(H)** and the allele for the pea comb **(h)** show incomplete dominance.

Using allele symbols, identify the genotype of a chicken with a pea comb.

hh

Part B

Chickens with pea combs have an advantage in cold climates because the pea comb reduces the amount of heat loss the chicken experiences.

Describe how the frequencies of the **H** allele and the **h** allele are expected to compare in a wild chicken population that lives in a cold climate.

Most likely, the h allele will become more frequent in the chicken population because chickens with pea combs have an advantage in cold environments.

Part C

Explain how the allele frequencies you described in Part B could be produced as a result of natural selection.

Since the chickens with pea combs have an advantage over chickens with full size combs, the chickens with pea combs are more likely to survive long enough to reproduce and send their genes onto the next generation. This process is called natural selection, and the end result would be a higher frequency of the h allele.

Anchor Score 3

Part A

The allele for a full-size comb **(H)** and the allele for the pea comb **(h)** show incomplete dominance.

Using allele symbols, identify the genotype of a chicken with a pea comb.

hh

Part B

Chickens with pea combs have an advantage in cold climates because the pea comb reduces the amount of heat loss the chicken experiences.

Describe how the frequencies of the **H** allele and the **h** allele are expected to compare in a wild chicken population that lives in a cold climate.

The h allele will have greater frequency than the H allele in a wild chicken population that lives in a cold climate.

Part C

Explain how the allele frequencies you described in Part B could be produced as a result of natural selection.

The frequency of the h allele would be greater than the frequency of H because h, the allele for the pea comb, is the most favorable in cold climates. Pea combs (hh) reduces the most heat loss compared to the intermediate-sized comb (Hh) and the full-sized comb (HH). Those chickens with the h allele would be better suited to the cold environment and survive compared to those chickens with the H allele.

Anchor Score 2

Part A

The allele for a full-size comb **(H)** and the allele for the pea comb **(h)** show incomplete dominance.

Using allele symbols, identify the genotype of a chicken with a pea comb.

hh

Part B

Chickens with pea combs have an advantage in cold climates because the pea comb reduces the amount of heat loss the chicken experiences.

Describe how the frequencies of the **H** allele and the **h** allele are expected to compare in a wild chicken population that lives in a cold climate.

In a cold climate the frequency of the h allele would be much higher than the H allele, because the h allele gives off less heat & keeps the chicken warmer

Part C

Explain how the allele frequencies you described in Part B could be produced as a result of natural selection.

The frequency of the h allele being more could be produced as a result from natural selection because it keeps the bird warmer and uses less energy, so over time the h allele became more popular through natural selection.

Anchor Score 1

Part A

The allele for a full-size comb **(H)** and the allele for the pea comb **(h)** show incomplete dominance.

Using allele symbols, identify the genotype of a chicken with a pea comb.

hh

Part B

Chickens with pea combs have an advantage in cold climates because the pea comb reduces the amount of heat loss the chicken experiences.

Describe how the frequencies of the **H** allele and the **h** allele are expected to compare in a wild chicken population that lives in a cold climate.

In a cold climate wild chickens will have a pea comb. this helps reduce the amount of heat loss.

Part C

Explain how the allele frequencies you described in Part B could be produced as a result of natural selection.

The chickens in a cold climate would have pea combs because it helps them reduce the amount of heat loss. This is natural selection because the chickens know their pea comb will protect them.

Anchor Score 0

Part A

The allele for a full-size comb **(H)** and the allele for the pea comb **(h)** show incomplete dominance.

Using allele symbols, identify the genotype of a chicken with a pea comb.

Hh, hh

Part B

Chickens with pea combs have an advantage in cold climates because the pea comb reduces the amount of heat loss the chicken experiences.

Describe how the frequencies of the **H** allele and the **h** allele are expected to compare in a wild chicken population that lives in a cold climate.

The chickens without pea combs will decrease because they will get cold, get sick and die.

Part C

Explain how the allele frequencies you described in Part B could be produced as a result of natural selection.

It’s because the population will change in the chickens.

Set of Student Responses without Scores (for educator practice)

Chicken Combs

Response A

Part A

The allele for a full-size comb (**H**) and the allele for the pea comb (**h**) show incomplete dominance.

Using allele symbols, identify the genotype of a chicken with a pea comb.

hh

Part B

Chickens with pea combs have an advantage in cold climates because the pea comb reduces the amount of heat loss the chicken experiences.

Describe how the frequencies of the **H** allele and the **h** allele are expected to compare in a wild chicken population that lives in a cold climate.

The “h” allele is going to be more frequent than the “H” allele. This is because many of the chicken will adjust to the pea comb and produce offspring with the pea comb so as to prevent loss of heat during the cold climate.

Part C

Explain how the allele frequencies you described in Part B could be produced as a result of natural selection.

The “h” allele will be more frequent than the “H” allele as a result of natural selection. This is because due to the cold climate the chicken will adjust by developing a pea comb so as to reduce loss of heat.

Response B

Part A

The allele for a full-size comb (**H**) and the allele for the pea comb (**h**) show incomplete dominance.

Using allele symbols, identify the genotype of a chicken with a pea comb.

hh

Part B

Chickens with pea combs have an advantage in cold climates because the pea comb reduces the amount of heat loss the chicken experiences.

Describe how the frequencies of the **H** allele and the **h** allele are expected to compare in a wild chicken population that lives in a cold climate.

The frequency of the H allele will be far less than the frequency of the h allele in a chicken population that lives in a cold climate.

Part C

Explain how the allele frequencies you described in Part B could be produced as a result of natural selection.

This would occur because the pea combed chicken with the h allele would have an advantage over the full sized comb chickens with an H allele. Pea combed chickens wouldn't use as much energy as long combed chickens, allowing for a much higher rate of survival. Natural selection dictates that pea combed chickens would live on and produce more offspring, passing on their genes.

Response C

Part A

The allele for a full-size comb (**H**) and the allele for the pea comb (**h**) show incomplete dominance.

Using allele symbols, identify the genotype of a chicken with a pea comb.

hh

Part B

Chickens with pea combs have an advantage in cold climates because the pea comb reduces the amount of heat loss the chicken experiences.

Describe how the frequencies of the **H** allele and the **h** allele are expected to compare in a wild chicken population that lives in a cold climate.

There will be more pea combed chickens, because of the reduced heat loss.

Part C

Explain how the allele frequencies you described in Part B could be produced as a result of natural selection.

It could be part of natural selection because the weather would be the one controlling the pea comb and full size comb populations.

Response D

Part A

The allele for a full-size comb (**H**) and the allele for the pea comb (**h**) show incomplete dominance.

Using allele symbols, identify the genotype of a chicken with a pea comb.

hh

Part B

Chickens with pea combs have an advantage in cold climates because the pea comb reduces the amount of heat loss the chicken experiences.

Describe how the frequencies of the **H** allele and the **h** allele are expected to compare in a wild chicken population that lives in a cold climate.

The frequency of the H allele would be less than the frequency of the h allele in a wild chicken population that lives in a cold climate.

Part C

Explain how the allele frequencies you described in Part B could be produced as a result of natural selection.

The h allele would be more frequent because the chickens with the H allele would be less likely to survive because of the great amount of heat loss. The chickens with the h allele would be more likely to survive. Over time the wild chickens would have the h allele because of natural selection.

Response E

Part A

The allele for a full-size comb (**H**) and the allele for the pea comb (**h**) show incomplete dominance.

Using allele symbols, identify the genotype of a chicken with a pea comb.

hh

Part B

Chickens with pea combs have an advantage in cold climates because the pea comb reduces the amount of heat loss the chicken experiences.

Describe how the frequencies of the **H** allele and the **h** allele are expected to compare in a wild chicken population that lives in a cold climate.

The h allele is more expected to be frequent because this allele helps the chicken more form the cold weather that the H allele would.

Part C

Explain how the allele frequencies you described in Part B could be produced as a result of natural selection.

This allele could be produced as a result of natural selection because over time the chicken would want to adapt to their environment and the h allele is more helpful than the H allele.

2024 MCAS Informational Webinar on Scoring Constructed-Responses

Sample Constructed-Response Item Training Pack

High School Biology
Plants and Insects Investigation

This question has three parts.

A student is studying how flowering plants and insects affect oxygen (O_2) and carbon dioxide (CO_2) concentrations in the air.

Part A

Identify the cellular process performed **only** by the flowering plants that affects the concentration of O_2 and CO_2 in the air.

Part B

Identify the cellular process performed by both the flowering plants and the insects that affects the concentration of O_2 and CO_2 in the air.

Part C

During an experiment, the student measured the initial concentrations of O_2 and CO_2 in three flasks, added organisms to some of the flasks, sealed the flasks, and placed them under a light. After 12 hours, the student measured the concentrations of O_2 and CO_2 in the flasks. The results for each flask are shown in the table.

Row	Flask Contents	Initial O_2 Concentration (%)	Final O_2 Concentration (%)	Initial CO_2 Concentration (ppm)*	Final CO_2 Concentration (ppm)*
1	?	20.8	20.8	373	375
2	?	20.9	19.6	371	454
3	?	20.7	22.1	374	267

*parts per million

During the experiment, the student had forgotten to identify the contents of each flask. Each of the three flasks contained one of the following: two plants and one insect; one insect; or no organisms.

Identify the contents of **each** flask based on the data in rows 1, 2, and 3. Explain your reasoning using data from the table and the processes you identified in Parts A and B. Include the row numbers in your response.

Scoring Guide

Score	Description
4	The response demonstrates a thorough understanding of photosynthesis and cellular respiration. The response correctly identifies the cellular process only the flowering plants perform and also correctly identifies the cellular process that both the flowering plants and insects perform. The response correctly identifies the contents of each flask and clearly explains the reasoning.
3	The response demonstrates a general understanding of photosynthesis and cellular respiration.
2	The response demonstrates a limited understanding of photosynthesis and cellular respiration.
1	The response demonstrates a minimal understanding of photosynthesis and cellular respiration,
0	The response is incorrect or contains some correct work that is irrelevant to the skill or concept being measured.
Blank	No response.

Scoring Notes

Part A

photosynthesis

Part B

cellular respiration/respiration

Part C

Row	Contents	Explanation
1	no organisms	little/no change in gas concentrations
2	one insect	insect performs [cellular] respiration, so O_2 decreased and CO_2 increased
3	two plants and one insect	plants perform photosynthesis, so O_2 increased and CO_2 decreased

Notes:

- 5 pts = 4 score; 4 pts = 3 score; 2-3 pts = 2 score; 1 pt = 1 score
- For a score of 4, must use data from the table and include cellular processes in response.
- At scores of 3 and below, if Parts A and B are correct, accept response to Part C that does not include processes in the explanation.
- At scores of 2 and below, 3 IDs in Part C with no explanation is acceptable.

Anchor Set of Student Responses (with scores)

Plants and Insects Investigation

Anchor Score 4

Part A

Identify the cellular process performed **only** by the flowering plants that affects the concentration of O_2 and CO_2 in the air.

The flowering plants use photosynthesis which affects the CO2 and O2 concentrations.

Part B

Identify the cellular process performed by both the flowering plants and the insects that affects the concentration of O_2 and CO_2 in the air.

Cellular respiration affects the CO2 and O2 concentration levels

Part C

During an experiment, the student measured the initial concentrations of O_2 and CO_2 in three flasks, added organisms to some of the flasks, sealed the flasks, and placed them under a light. After 12 hours, the student measured the concentrations of O_2 and CO_2 in the flasks. The results for each flask are shown in the table.

Row	Flask Contents	Initial O_2 Concentration (%)	Final O_2 Concentration (%)	Initial CO_2 Concentration (ppm)*	Final CO_2 Concentration (ppm)*
1	?	20.8	20.8	373	375
2	?	20.9	19.6	371	454
3	?	20.7	22.1	374	267

*parts per million

During the experiment, the student had forgotten to identify the contents of each flask. Each of the three flasks contained one of the following: two plants and one insect; one insect; or no organisms.

Identify the contents of **each** flask based on the data in rows 1, 2, and 3. Explain your reasoning using data from the table and the processes you identified in Parts A and B. Include the row numbers in your response.

Row 1 had no organisms in the flask because the O2 and CO2 levels had little change in concentration. Row 2 had one insect because the oxygen levels decreased but the CO2 levels increased due to cellular respiration. Row 3 had two plants and one insect because the O2 levels increased as there was more oxygen being made than used and the CO2 levels decreased due to photosynthesis.

Anchor Score 3

Part A

Identify the cellular process performed **only** by the flowering plants that affects the concentration of O_2 and CO_2 in the air.

The process of the flowering plants that affects the levels of O2 and CO2 in the air is photosynthesis.

Part B

Identify the cellular process performed by both the flowering plants and the insects that affects the concentration of O_2 and CO_2 in the air.

The process performed by both the flowering plants and insects that affects the concentration of O2 and CO2 in the air is cellular respiration.

Part C

During an experiment, the student measured the initial concentrations of O_2 and CO_2 in three flasks, added organisms to some of the flasks, sealed the flasks, and placed them under a light. After 12 hours, the student measured the concentrations of O_2 and CO_2 in the flasks. The results for each flask are shown in the table.

Row	Flask Contents	Initial O_2 Concentration (%)	Final O_2 Concentration (%)	Initial CO_2 Concentration (ppm)*	Final CO_2 Concentration (ppm)*
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3	?	20.7	22.1	374	267

*parts per million

During the experiment, the student had forgotten to identify the contents of each flask. Each of the three flasks contained one of the following: two plants and one insect; one insect; or no organisms.

Identify the contents of **each** flask based on the data in rows 1, 2, and 3. Explain your reasoning using data from the table and the processes you identified in Parts A and B. Include the row numbers in your response.

The contents of flask one was no organisms because the oxygen levels did not change at all. The contents of flask two was one insects because the oxygen levels went down and the carbon dioxide levels went up considerably. The contents of flask three was two plants and one insect because the oxygen levels went up slightly and the carbon dioxide levels went down significantly.

Anchor Score 2

Part A

Identify the cellular process performed **only** by the flowering plants that affects the concentration of O_2 and CO_2 in the air.

The cellular process performed only by the flowering plants that affects the concentrations of O2 and CO2 in the air is called photosynthesis.

Part B

Identify the cellular process performed by both the flowering plants and the insects that affects the concentration of O_2 and CO_2 in the air.

The cellular process performed by both the flowering plants and insects is called cellular respiration.

Part C

During an experiment, the student measured the initial concentrations of O_2 and CO_2 in three flasks, added organisms to some of the flasks, sealed the flasks, and placed them under a light. After 12 hours, the student measured the concentrations of O_2 and CO_2 in the flasks. The results for each flask are shown in the table.

Row	Flask Contents	Initial O_2 Concentration (%)	Final O_2 Concentration (%)	Initial CO_2 Concentration (ppm)*	Final CO_2 Concentration (ppm)*
1	?	20.8	20.8	373	375
2	?	20.9	19.6	371	454
3	?	20.7	22.1	374	267

*parts per million

During the experiment, the student had forgotten to identify the contents of each flask. Each of the three flasks contained one of the following: two plants and one insect; one insect; or no organisms.

Identify the contents of **each** flask based on the data in rows 1, 2, and 3. Explain your reasoning using data from the table and the processes you identified in Parts A and B. Include the row numbers in your response.

There were two plants and one insect in each flask. The data table shows that there is oxygen and carbon dioxide being produced. The plants produce the oxygen and the insect produces carbon dioxide. If there was one insect or no organisms in each then there would be little to none carbon dioxide and oxygen.

Anchor Score 1

Part A

Identify the cellular process performed **only** by the flowering plants that affects the concentration of O_2 and CO_2 in the air.

The cellular process performed would be photosynthesis

Part B

Identify the cellular process performed by both the flowering plants and the insects that affects the concentration of O_2 and CO_2 in the air.

The cellular process performed would also be photosynthesis

Part C

During an experiment, the student measured the initial concentrations of O_2 and CO_2 in three flasks, added organisms to some of the flasks, sealed the flasks, and placed them under a light. After 12 hours, the student measured the concentrations of O_2 and CO_2 in the flasks. The results for each flask are shown in the table.

Row	Flask Contents	Initial O_2 Concentration (%)	Final O_2 Concentration (%)	Initial CO_2 Concentration (ppm)*	Final CO_2 Concentration (ppm)*
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2	?	20.9	19.6	371	454
3	?	20.7	22.1	374	267

*parts per million

During the experiment, the student had forgotten to identify the contents of each flask. Each of the three flasks contained one of the following: two plants and one insect; one insect; or no organisms.

Identify the contents of **each** flask based on the data in rows 1, 2, and 3. Explain your reasoning using data from the table and the processes you identified in Parts A and B. Include the row numbers in your response.

Row one = one insect because the final concentration is not the highest Row two = two plants and one insect because the final concentration is the highest on the chart Row three = no organisms because it has the lowest final concentration

Anchor Score 0

Part A

Identify the cellular process performed **only** by the flowering plants that affects the concentration of O_2 and CO_2 in the air.

cellular respiration

Part B

Identify the cellular process performed by both the flowering plants and the insects that affects the concentration of O_2 and CO_2 in the air.

photosynthesis

Part C

During an experiment, the student measured the initial concentrations of O_2 and CO_2 in three flasks, added organisms to some of the flasks, sealed the flasks, and placed them under a light. After 12 hours, the student measured the concentrations of O_2 and CO_2 in the flasks. The results for each flask are shown in the table.

Row	Flask Contents	Initial O_2 Concentration (%)	Final O_2 Concentration (%)	Initial CO_2 Concentration (ppm)*	Final CO_2 Concentration (ppm)*
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2	?	20.9	19.6	371	454
3	?	20.7	22.1	374	267

*parts per million

During the experiment, the student had forgotten to identify the contents of each flask. Each of the three flasks contained one of the following: two plants and one insect; one insect; or no organisms.

Identify the contents of **each** flask based on the data in rows 1, 2, and 3. Explain your reasoning using data from the table and the processes you identified in Parts A and B. Include the row numbers in your response.

Row one - one insect
Row two - two plants and one insect
Row three - no organisms

Set of Student Responses without Scores (for educator practice)

Plants and Insects Investigation

Response A

Part A

Identify the cellular process performed **only** by the flowering plants that affects the concentration of O_2 and CO_2 in the air.

The cellular process performed only be the flowering plants that affects the concentrations of O2 and CO2 in the air is photosynthesis.

Part B

Identify the cellular process performed by both the flowering plants and the insects that affects the concentration of O_2 and CO_2 in the air.

The cellular process performed by both the flowering plants and the insects that affects the concentrations of O2 and CO2 in the air would be cellular respiration.

Part C

During an experiment, the student measured the initial concentrations of O_2 and CO_2 in three flasks, added organisms to some of the flasks, sealed the flasks, and placed them under a light. After 12 hours, the student measured the concentrations of O_2 and CO_2 in the flasks. The results for each flask are shown in the table.

Row	Flask Contents	Initial O_2 Concentration (%)	Final O_2 Concentration (%)	Initial CO_2 Concentration (ppm)*	Final CO_2 Concentration (ppm)*
1	?	20.8	20.8	373	375
2	?	20.9	19.6	371	454
3	?	20.7	22.1	374	267

*parts per million

During the experiment, the student had forgotten to identify the contents of each flask. Each of the three flasks contained one of the following: two plants and one insect; one insect; or no organisms.

Identify the contents of **each** flask based on the data in rows 1, 2, and 3. Explain your reasoning using data from the table and the processes you identified in Parts A and B. Include the row numbers in your response.

Row one - no organisms,
Row two - one insect,
Row three - two plants and one insect.

Response B

Part A

Identify the cellular process performed **only** by the flowering plants that affects the concentration of O_2 and CO_2 in the air.

Photosynthesis is the cellular process performed only by flowering plants that affects the concentrations of O2 and CO2 in the air.

Part B

Identify the cellular process performed by both the flowering plants and the insects that affects the concentration of O_2 and CO_2 in the air.

Cellular respiration is performed by both the flowering plants and the insects that affects the concentrations of O2 and CO2 in the air.

Part C

During an experiment, the student measured the initial concentrations of O_2 and CO_2 in three flasks, added organisms to some of the flasks, sealed the flasks, and placed them under a light. After 12 hours, the student measured the concentrations of O_2 and CO_2 in the flasks. The results for each flask are shown in the table.

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3	?	20.7	22.1	374	267

*parts per million

During the experiment, the student had forgotten to identify the contents of each flask. Each of the three flasks contained one of the following: two plants and one insect; one insect; or no organisms.

Identify the contents of **each** flask based on the data in rows 1, 2, and 3. Explain your reasoning using data from the table and the processes you identified in Parts A and B. Include the row numbers in your response.

In row 1, there are no organisms in the flask because there is no effect to the amount of oxygen in the flask, and CO2 only went up by 2 ppm. In row 2, there is one insect because oxygen levels reduced and CO2 level drastically increased. In row 3, there are two plants and an insect because oxygen levels rose and CO2 levels dropped due to photosynthesis from the plants.

Response C

Part A

Identify the cellular process performed **only** by the flowering plants that affects the concentration of O_2 and CO_2 in the air.

The cellular process performed only by the flowering plants that affects the concentrations of O2 and CO2 in the air is photosynthesis.

Part B

Identify the cellular process performed by both the flowering plants and the insects that affects the concentration of O_2 and CO_2 in the air.

The cellular process performed by both the flowering plants and the insects that affects the concentrations of O2 and CO2 in the air is cellular respiration.

Part C

During an experiment, the student measured the initial concentrations of O_2 and CO_2 in three flasks, added organisms to some of the flasks, sealed the flasks, and placed them under a light. After 12 hours, the student measured the concentrations of O_2 and CO_2 in the flasks. The results for each flask are shown in the table.

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2	?	20.9	19.6	371	454
3	?	20.7	22.1	374	267

*parts per million

During the experiment, the student had forgotten to identify the contents of each flask. Each of the three flasks contained one of the following: two plants and one insect; one insect; or no organisms.

Identify the contents of **each** flask based on the data in rows 1, 2, and 3. Explain your reasoning using data from the table and the processes you identified in Parts A and B. Include the row numbers in your response.

In row 1 there is no organisms. I know that because it is showing no oxygen, but organisms need oxygen to survive. In row 2 there is only an insect. I know that because there is a drop in oxygen meaning some of it was used. And finally in row 3 is the insect and the two plants. I know that because the CO2 is less and that is what the plant uses.

Response D

Part A

Identify the cellular process performed **only** by the flowering plants that affects the concentration of O_2 and CO_2 in the air.

Only the flowering plants perform photosynthesis in order to produce food for themselves.

Part B

Identify the cellular process performed by both the flowering plants and the insects that affects the concentration of O_2 and CO_2 in the air.

Both the flowering plants and the insects perform cellular respiration to turn their food into energy (glucose into ATP).

Part C

During an experiment, the student measured the initial concentrations of O_2 and CO_2 in three flasks, added organisms to some of the flasks, sealed the flasks, and placed them under a light. After 12 hours, the student measured the concentrations of O_2 and CO_2 in the flasks. The results for each flask are shown in the table.

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1	?	20.8	20.8	373	375
2	?	20.9	19.6	371	454
3	?	20.7	22.1	374	267

*parts per million

During the experiment, the student had forgotten to identify the contents of each flask. Each of the three flasks contained one of the following: two plants and one insect; one insect; or no organisms.

Identify the contents of **each** flask based on the data in rows 1, 2, and 3. Explain your reasoning using data from the table and the processes you identified in Parts A and B. Include the row numbers in your response.

Flask 1 contains no organisms because the gas levels are stable, Flask 2 contains one insect because the O2 level decreased while the CO2 level increased (cellular respiration), and Flask 3 contains two plants and one insect because the O2 level increased while the CO2 level decreased (photosynthesis).

Response E

Part A

Identify the cellular process performed **only** by the flowering plants that affects the concentration of O_2 and CO_2 in the air.

carbon dioxide

Part B

Identify the cellular process performed by both the flowering plants and the insects that affects the concentration of O_2 and CO_2 in the air.

hydrogen oxide

Part C

During an experiment, the student measured the initial concentrations of O_2 and CO_2 in three flasks, added organisms to some of the flasks, sealed the flasks, and placed them under a light. After 12 hours, the student measured the concentrations of O_2 and CO_2 in the flasks. The results for each flask are shown in the table.

Row	Flask Contents	Initial O_2 Concentration (%)	Final O_2 Concentration (%)	Initial CO_2 Concentration (ppm)*	Final CO_2 Concentration (ppm)*
1	?	20.8	20.8	373	375
2	?	20.9	19.6	371	454
3	?	20.7	22.1	374	267

*parts per million

During the experiment, the student had forgotten to identify the contents of each flask. Each of the three flasks contained one of the following: two plants and one insect; one insect; or no organisms.

Identify the contents of **each** flask based on the data in rows 1, 2, and 3. Explain your reasoning using data from the table and the processes you identified in Parts A and B. Include the row numbers in your response.

Row one: no organism
Row two: one insect
Row three: 2 plants 1 insect