EOC BIOLOGY 2010

OPERATIONAL PERFORMANCE TASK

TOM ATO'S NEW CROP

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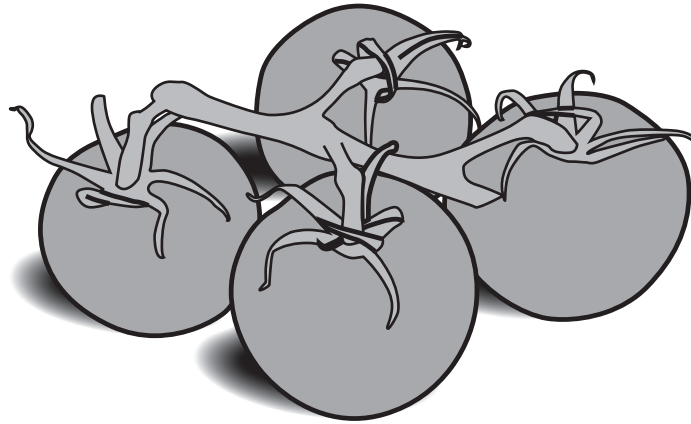
Part 1
Tom Ato's New Crop

Tom Ato, a farmer in central New Jersey, is attempting to improve the yield of his tomato crop. He wants to create a tomato **hybrid**[1] that will produce lots of tomatoes, reaching at least 10 ounces in size.

Tomatoes with cracks in them are harder to sell, so Tom Ato needs his tomato **hybrid** to resist **cracking**.[2] Unfortunately, soil testing has indicated that Tom Ato's soil is infected with **nematodes**[3] and **tomato mosaic virus**,[4] which affect the growth of the tomatoes.

Since treating his fields with chemicals to remove these disease-causing agents is expensive and can harm the environment, Tom Ato wants **hybrid** tomato plants that are resistant to these two infectious agents. He plans to cross two varieties of **purebred**[5] tomatoes in an attempt to obtain all of the traits he is looking for: crack-resistant, nematode-resistant, tomato mosaic virus-resistant, and at least 10 ounces in size.

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[1] **hybrid** – offspring of crosses between parents with different traits

[2] **cracking** – a common problem for tomatoes grown in regions where rainfall amounts can be unpredictable

[3] **nematodes** – microscopic roundworms living in soil that attack the roots of plants

[4] **tomato mosaic virus** – a common plant disease that lowers the quality and quantity of the crop

[5] **purebred** – organisms that carry only one variation of a characteristic

Figure 1
Varieties of Pure Breeding Tomatoes and Their Traits

Tomato Variety	Crack-Resistant Skin	Nematode-Resistant	Tomato Mosaic Virus-Resistant	Average Size of Tomato in ounces (oz.)
Abe Lincoln	+	+	0	13 oz.
Bambino	+	0	+	1 oz.
Beef	0	+	0	30 oz.
Better Boy	0	+	0	16 oz.
Box Car Willie	+	0	0	14 oz.
Celebrity	0	+	+	7 oz.
Goliath	0	+	0	15 oz.
Solar Fire	+	0	+	10 oz.

+ = trait is present in tomato

0 = trait is absent in tomato

PART 1

Your Task:

1) Select two varieties of **purebred** tomato to cross from Figure 1 to produce a **hybrid** tomato with **all** of the desired traits.

   - crack-resistant
   - nematode-resistant
   - tomato mosaic virus-resistant
   - at least 10 ounces in size

2) Explain, using evidence from the table in Figure 1, why the two tomato varieties were selected to cross in order to create the desired hybrid.

3) Although Tom chose a combination in which all four traits should be present, not all of the hybrid offspring produced had the desired traits.

   Discuss **ONE** reason as to why this outcome could occur.

4) Tom was successful in obtaining the desired traits from the two varieties of purebreds during the first cross. Looking ahead to the next planting season, would you recommend that he cross the first generation of hybrid offspring **OR** cross the purebred parents again?

   Justify your recommendation using biological concepts and principles.

Please use page 3 in your answer folder for prewriting and planning.

Please write your response in paragraph form on page 4 of the answer folder.

Tom Ato's New Crop
Scoring Rubric

4 POINTS	3 POINTS	2 POINTS	1 POINT
• Selects and thoroughly explains tomato cross choice that would achieve desired traits.	• Selects and explains tomato cross choice that would achieve desired traits.	• Selects tomato cross choice that would achieve desired traits.	• Does not select tomato cross choice that would achieve desired traits.
• Without any misconceptions, explains how desired traits are not always expressed.	• Explains how desired traits are not always expressed.	• Explains how desired traits are not always expressed, with some misconceptions.	• Does not explain how desired traits are not always expressed.
• Without any misconceptions, selects and justifies breeding recommendation for next generation.	• Selects breeding recommendation for next generation.	• Does not select breeding recommendation for next generation.	• Does not select breeding recommendation for next generation.
• All arguments are strongly based on scientific evidence and/or principles.	• Most arguments are based on scientific evidence and/or principles.	• Some arguments are based on scientific evidence and/or principles.	• Few to no arguments are based on scientific evidence and/or principles.

Did you remember to:

Explain why you chose the two tomato varieties to cross?

Discuss **ONE** reason why Tom Ato did not have a successful cross?

Recommend the next cross for Tom Ato's plants?

Justify all of your work using biological concepts and principles?