

# Ajax Seed Company

## Task Information

**Subject:** Biology

**Content:**

- MST Framework Reference:  
Standard 4-Science: The Living Environment  
Standard 1-Analysis, Inquiry, & Design: Scientific Inquiry
- Regents Biology Syllabus:  
Unit V: Topic I.A & Topic II.A
- Variance Biology Program Guide:  
Genetics and Molecular Biology: Patterns of Inheritance

**Format:** Paper/Pencil

**Purpose:** To analyze the genetic characteristics of some hypothetical seeds.

**Skills:**

**Primary:** Interpreting data, Predicting  
**Secondary:** Communicating, Classifying

**Time:** 15-20 min.

**Materials:** Worksheet

**Preparation:** None

**Safety:** N/A

**Extensions/Modifications:** None

# Ajax Seed Company

**Task:** At this station you will be analyzing the genetic characteristics of some hypothetical seeds

Ajax Seed Company has bags of seeds for sale that "...guarantees that all of the plants produced from this bag of seeds will be tall". A farmer planted seeds from one of these bags and found that all of the seeds that germinated grew into tall plants.

The farmer collected the seeds from many of these tall plants. When he planted the collected seeds the following year, only some of the new plants were tall while the others were short.

Note: If symbols are used in your responses, a key must be provided.

1. What are all the possible genotype crosses that the Ajax Seed Company could have used to produced the first bag of seeds ?

\_\_\_\_\_  
Explain your answer, using complete sentences.

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

2. What are the possible genotype(s) of the seeds in the bag that the farmer bought?

\_\_\_\_\_  
Explain your answer, using complete sentences.

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

3. Using complete sentences explain how the collected seed could produce both tall and short plants.

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4. The farmer wants to produce a pure breeding line of tall plants. Each year he collects seeds **only** from tall plants. The following summer, he plants the collected seeds. After five years of doing this, can he guarantee that all the collected seeds will result in tall plants?

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Explain your answer, using complete sentences.

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# Ajax Seed Company - Scoring Rubric

## Maximum score - 12 points

This assessment task is to be used after students have had instruction in Mendelian Genetics.

**NOTE:** If the student uses symbols, a key must be provided.

### Question 1 - First Seeds

**4 points total**

Criteria ;

- **Genotype identification**

- Allow 2 points if the student identifies all possible crosses using words or symbols ( with key)

Key:

T = tall allele

t = short allele

pure tall (TT) X heterozygous tall (Tt)

pure tall(TT) X pure short (tt)

- Allow 1 point if the student;
  - identifies both crosses with **no** key if symbols are used
  - identifies only one (1) cross with a key if symbols are used
- No credit if the student identifies no correct crosses or only one (1) cross with no key.
- **Explanation**
  - Allow 2 points if the student provides a correct explanation that describes the presence of the dominant gene as being necessary for the trait to appear in the first offspring. The response should be written in complete sentences.
  - Allow 1 point if the student provides a correct explanation, but it is not in complete sentences.
  - No credit if the student gives an incorrect explanation even if it is in complete sentences.

### Question 2 - Offspring Seeds

**4 points total**

Criteria:

- **Genotypes present**

- Allow 2 points if the student identifies all possible correct genotypes using words or symbols with a key. (the key from question 1 may be used)
  - Both homozygous (pure) tall(TT) and heterozygous(Tt)
- Allow 1 point if the student;
  - Identifies both genotypes with **no** key if symbols are used
  - identifies only heterozygous tall with a key if symbols are used
- No credit if the student makes no correct identifications or only one (1) correct identification with **no** key.

- **Explanation**

- Allow 2 points if the student provides a correct explanation that describes the presence of the recessive gene in some of the seeds using c complete sentences
- Allow 1 point if the student provides a correct explanation, but not in complete sentences.
- No credit if the student gives an incorrect explanation even if it is in complete sentences.

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**Question 3 - Explanation****2 points total****Criteria:**

- Allow 1 point if the student provides a correct explanation that describes the presence of both dominant and recessive genes as being necessary in each parent for both traits (tall and short height) to appear in the offspring. This explanation may be shown by the cross hybrid tall x hybrid tall by using words, or symbols with a key as shown above. The response should be in complete sentences.
- Allow 1 point if the student provides a correct explanation, but it is not in complete sentences.
- No credit if the student gives an incorrect response even if it is incomplete sentences.

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**Question 4 - Explanation of Guarantee****2 points total****Criteria:**

- **Do not score** Student's response to "....can he guarantee that...."
- Allow 2 points if the student provides a correct explanation that describes the possibility of the recessive gene being masked by the presence of the dominant gene in any plant with the tall trait from which seeds are collected. The response should be in complete sentences.
- Allow 1 point for a correct explanation, but not written in complete sentences.
- No credit for an incorrect response even if it is in complete sentences.

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**Highest possible score - 12 points**

Student ID \_\_\_\_\_ Scoring Form - Ajax Seed Company  
 Male / Female (circle one)

Circle the student's score for each question. Add the points for each question and write the total score at the bottom of the scoring form.

- |  |                      |   |   |   |
|--|----------------------|---|---|---|
| 1. First seeds used                          | Cross Identification | 0 | 1 | 2 |
|  | Explanation          | 0 | 1 | 2 |
| 2. Genotypes of seeds purchased              | Genotype             | 0 | 1 | 2 |
|  | Explanation          | 0 | 1 | 2 |
| 3. Explanation of dominant & recessive genes |                      | 0 | 1 | 2 |
| 4. Explanation of guarantee                  |                      | 0 | 1 | 2 |

Total Score \_\_\_\_\_  
 Total possible score - 12 points

Student ID \_\_\_\_\_ Scoring Form - Ajax Seed Company  
 Male / Female (circle one)

Circle the student's score for each question. Add the points for each question and write the total score at the bottom of the scoring form.

- |  |                      |   |   |   |
|--|----------------------|---|---|---|
| 1. First seeds used                          | Cross Identification | 0 | 1 | 2 |
|  | Explanation          | 0 | 1 | 2 |
| 2. Genotypes of seeds purchased              | Genotype             | 0 | 1 | 2 |
|  | Explanation          | 0 | 1 | 2 |
| 3. Explanation of dominant & recessive genes |                      | 0 | 1 | 2 |
| 4. Explanation of guarantee                  |                      | 0 | 1 | 2 |

Total Score \_\_\_\_\_  
 Total possible score - 12 points

Student ID Bio - AS - 1 Scoring Form - Ajax Seed Company  
Male / Female (circle one)

Circle the student's score for each question. Add the points for each question and write the total score at the bottom of the scoring form.

1.	<b>First seeds used</b>			
	Cross Identification	0	1	(2)
	Explanation	0	1	(2)
2.	<b>Genotypes of seeds purchased</b>			
	Genotype	0	1	(2)
	Explanation	0	1	(2)
3.	<b>Explanation of dominant &amp; recessive genes</b>	0	1	(2)
4.	<b>Explanation of guarantee</b>	0	1	(2)
	<b>Total Score</b>			<u>12 pts</u>
				Total possible score - 12 points

Student ID Bio - AS - 2 Scoring Form - Ajax Seed Company  
Male / Female (circle one)

Circle the student's score for each question. Add the points for each question and write the total score at the bottom of the scoring form.

1.	<b>First seeds used</b>			
	Cross Identification	0	(1)	2
	Explanation	0	1	(2)
2.	<b>Genotypes of seeds purchased</b>			
	Genotype	0	(1)	2
	Explanation	0	1	(2)
3.	<b>Explanation of dominant &amp; recessive genes</b>	0	1	(2)
4.	<b>Explanation of guarantee</b>	0	(1)	2
	<b>Total Score</b>			<u>9</u>
				Total possible score - 12 points

Student ID B10-AS-3 Scoring Form - Ajax Seed Company  
Male / Female (circle one)

Circle the student's score for each question. Add the points for each question and write the total score at the bottom of the scoring form.

- 1. First seeds used
  - Cross Identification  0  1  2
  - Explanation  0  1  2
- 2. Genotypes of seeds purchased
  - Genotype  0  1  2
  - Explanation  0  1  2
- 3. Explanation of dominant & recessive genes  0  1  2
- 4. Explanation of guarantee  0  1  2

Total Score 2 pts  
Total possible score - 12 points

Student ID \_\_\_\_\_ Scoring Form - Ajax Seed Company  
Male / Female (circle one)

Circle the student's score for each question. Add the points for each question and write the total score at the bottom of the scoring form.

- 1. First seeds used
  - Cross Identification  0  1  2
  - Explanation  0  1  2
- 2. Genotypes of seeds purchased
  - Genotype  0  1  2
  - Explanation  0  1  2
- 3. Explanation of dominant & recessive genes  0  1  2
- 4. Explanation of guarantee  0  1  2

Total Score \_\_\_\_\_  
Total possible score - 12 points



## Ajax Seed Company

**Task:** At this station you will be analyzing the genetic characteristics of some hypothetical seeds

Ajax Seed Company has bags of seeds for sale that "...guarantees that all of the plants produced from this bag of seeds will be tall". A farmer planted seeds from one of these bags and found that all of the seeds that germinated grew into tall plants.

The farmer collected the seeds from many of these tall plants. When he planted the collected seeds the following year, only some of the new plants were tall while the others were short.

Note: If symbols are used in your responses, a key must be provided.

1. What are all the possible genotype crosses that the Ajax Seed Company could have used to produced the first bag of seeds ?

Key -

T = Tall gene TT x Tt or TT x tt

t = Short gene

Explain your answer, using complete sentences.

To have all the plants from the factory to have grown tall, they must have all had the dominant gene. If the pure dominant crosses with anything it must have the dominant gene.

2. What are the possible genotype(s) of the seeds in the bag that the farmer bought?

TT and Tt

Explain your answer, using complete sentences.

Some of the seeds must have had the recessive gene but all must have had at least one dominant gene.

3. Using complete sentences explain how the collected seed could produce both tall and short plants.

If two plants that both have the hidden  
recessive gene are crossed, then there is a  
chance the 2 recessive will combine to make  
some short. The plants with only one recessive will  
be tall.

4. The farmer wants to produce a pure breeding line of tall plants. Each year he collects seeds **only** from tall plants. The following summer, he plants the collected seeds. After five years of doing this, can he guarantee that all the collected seeds will result in tall plants?

No

Explain your answer, using complete sentences.

Even after 5 years some hybrid seed  
could still have carried a recessive gene which  
could combine to make seed have only  
short genes.

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The farmer collected the seeds from many of these tall plants. When he planted the collected seeds the following year, only some of the new plants were tall while the others were short.

Note: If symbols are used in your responses, a key must be provided.

1. What are all the possible genotype crosses that the Ajax Seed Company could have used to produced the first bag of seeds ?

Pure Tall and a pure Short.

Explain your answer, using complete sentences.

This cross would make sure that all the seeds would grow tall but some of the next seeds could be short.

2. What are the possible genotype(s) of the seeds in the bag that the farmer bought?

Pure They would be hybrids.

Explain your answer, using complete sentences.

Some of the next generation were short so this meant there was some recessive genes in the seeds.

3. Using complete sentences explain how the collected seed could produce both tall and short plants.

Since short is recessive, the seeds carried a hidden gene. This can get shown in the next generation.

4. The farmer wants to produce a pure breeding line of tall plants. Each year he collects seeds **only** from tall plants. The following summer, he plants the collected seeds. After five years of doing this, can he guarantee that all the collected seeds will result in tall plants?

no

Explain your answer, using complete sentences.

Some chance of them being hidden short.

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The farmer collected the seeds from many of these tall plants. When he planted the collected seeds the following year, only some of the new plants were tall while the others were short.

Note: If symbols are used in your responses, a key must be provided.

1. What are all the possible genotype crosses that the Ajax Seed Company could have used to produced the first bag of seeds ?

They cross  $T T \times T t$

Explain your answer, using complete sentences.

You got to have lots of Big T's - together  
all tall

2. What are the possible genotype(s) of the seeds in the bag that the farmer bought?

All TALLS

Explain your answer, using complete sentences.

The All got to be Tall.

3. Using complete sentences explain how the collected seed could produce both tall and short plants.

starts are hidden at first  
crossing to hybrids gets  
you short.

4. The farmer wants to produce a pure breeding line of tall plants. Each year he collects seeds **only** from tall plants. The following summer, he plants the collected seeds. After five years of doing this, can he guarantee that all the collected seeds will result in tall plants?

No

Explain your answer, using complete sentences.

short is a hidden that you  
don't know is there so you  
never be for sure in 5 years