

Name

answers

12. Lac Operon (30 points)

A. Given the genotypes, fill in the appropriate phenotypes for LacZ and LacY. The inducer is lactose or IPTG.

Genotype	Phenotypes			
	LacZ expression		LacY expression	
	no inducer	inducer	no inducer	inducer
1 I ⁺ O ⁺ Z ⁺ Y ⁺	-	+	-	+
2 I ^S O ⁺ Z ⁺ Y ⁻	-	-	-	-
3 I ^S O ⁺ Z ⁻ Y ⁻ / F' I ⁻ O ^C Z ⁺ Y ⁺	+	+	+	+
4 I ⁺ O ^C Z ⁻ Y ⁻ / F' I ⁻ O ⁺ Z ⁻ Y ⁺	-	-	-	+
5 I ⁻ O ^C Z ⁻ Y ⁺ / F' I ^S O ⁺ Z ⁺ Y ⁻	-	-	+	+

10 pt, 1/2 ea

B. Name one strain that indicates that O^C is epistatic to I^S, and what data tells you that?

Strain 5- that Y is expressed tells you that O^C is epistatic to I^S

2pt

Strain 3: both Z⁺ and Y⁺ expression tells you that O^C is epistatic to I^S

C. A new gene is identified that regulates the Lac operon, called Gene T.

An allele Gene T-2 was analyzed.

We know that Gene T⁺ acts in the glucose, ADC1, CRP pathway.

The assays of Gene T⁺ function are done in a I⁻ cell, with glucose present.

(The phenotypes would be complicated by reporting LacZ expression with no glucose and with glucose column. However, you can figure this out using this data alone).

i. Is Gene T-2 **recessive** or **dominant** (circle one)
2pt

ii. Draw the glucose, Gene T⁺, ADC1, CRP, LacZ, pathway, with gene order and sign of regulation (bar or arrow)



iii. Why is the combination of strains 2, 4 and 5 not informative for trying to determine the order of function of GeneT⁺ and ADC1⁺?

both single mutants have the same phenotype.

Strain	LacZ expression
1. GeneT ⁺	-
2. GeneT-2	+
3. GeneT-2/ Gene T ⁺	+
4. ADC1*	+
5. ADC1* GeneT-2	+
6. ADC1-	-
7. ADC1- Gene T-2	+
8. CRP -	-
9. CRP- GeneT-2	-