

QUIZ #1

YOUR NAME (please print legibly): _____ **ANSWER KEY** _____

As succinctly, but as thoroughly and as accurately as you can, answer the following questions:

(1) You are given a yeast strain with the following genotype:
MATa fus3Δ::LEU2 kss1Δ::HIS3 LYS2::KSS1_{prom}-lacZ ade2 his3 leu2 lys2 trp1 ura3
will this strain grow on (circle the correct answer):

- | | | | |
|----------------|--------------------------------------|-------------------------------------|------------|
| (a) YPD | <input checked="" type="radio"/> Yes | No | [2 points] |
| (b) SC-Leu | <input checked="" type="radio"/> Yes | No | [2 points] |
| (c) SC-Ura | Yes | <input checked="" type="radio"/> No | [2 points] |
| (d) SC-Lys-Ade | Yes | <input checked="" type="radio"/> No | [2 points] |
| (e) SC+X-gal | <input checked="" type="radio"/> Yes | No | [2 points] |

(2) What is the difference between extragenic (chromosomal) suppression of a mutation and dosage suppression of the same mutation? [5 points]

An extragenic (also called intergenic) suppressor is a second mutation elsewhere in the genome (i.e. in a different gene) that restores a normal or near-normal phenotype to cells that would otherwise have a mutant phenotype due to an initial mutation in another gene. A dosage suppressor, as it is applied in yeast genetics, is a gene, whose product when present at an elevated concentration in the cell (due to the gene being introduced on a multi-copy plasmid and/or expressed from a strong non-natural promoter) restores a normal or near-normal phenotype to cells that would otherwise have a mutant phenotype due to an initial mutation in a chromosomal gene.

(3) Assuming both genes are expressed at the same level in a diploid cell, is the normal (wild-type) allele of a gene always dominant to a recessive loss-of-function allele at the same locus?

Circle one: YES ; and, then explain the logic behind your answer. [5 points]

You are given that the loss-of-function allele is recessive. The means to determine that an allele is recessive is that no mutant phenotype is manifested when the loss-of-function mutation is combined with the corresponding normal wild-type gene in the same (diploid) cell. Hence, the definition of a recessive loss-of-function allele is that it does not interfere with or otherwise affect the function of the corresponding wild-type gene product.

(4) You have a freshly grown culture of a yeast strain that has an optical density (absorbance) at 660 nm of 1 (where 1 $A_{660\text{nm}}$ unit corresponds to a cell density of 10^8 per ml). If you mix the culture well, serially dilute the culture 10,000-fold (e.g. by putting 0.1 ml into 0.9 ml of sterile buffer, and taking 0.1 ml of the resulting mixture and adding it to 0.9 ml of sterile buffer, and so on), and then plate 10 μl of the final cell suspension on a YPD plate, how many colonies would you expect to see on your plate? CIRCLE your final answer and show your calculations or explain your logic. [5 points]

You are given that the starting culture had a cell density of 10^8 per ml.

You are then told that the culture was diluted 10,000-fold; so, $10^8 / \text{ml} \times 10^{-4} = 10^4 / \text{ml}$.

*You then plated 10 μl (i.e. 0.01 ml) of the dilution; so, $10^4 / \text{ml} \times 0.01 \text{ ml} = 10^2 \text{ cells} = 100 \text{ cells}$. If all 100 cells are viable, they should give rise to **100 colonies on the plate.***