1. Yeast Mating Pathways (25 points)

A. Give one reason why it is easier to identify mutants in yeast than it is in human cells (5pt)

Yeast can be haploids which allows direct detection of recessive mutants.

OR

Yeast undergo meiosis to generate haploids that can be analyzed for mutant phenotypes

B. Given in the table are mutants in mating pathway. Each mutant has only one mutation as indicated.Ste70* and ste80* are two mutants of the STE70+ and STE80+ genes, respectively. STE70+ and STE80+ are not linked.

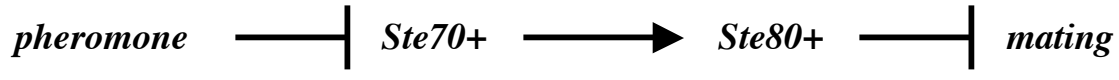
	Genotype	Phenotype
1.	Ste+	mates normally
2.	ste80*	never mates
3.	ste70*	always mates
4.	ste80*/STE80+	never mates
5.	ste70*/STE70+	mates normally
6.	ste70* ste80*	never mates

i. Is ste80* recessive or (dominant) (circle one)?

ii. Is ste70* (recessive) or dominant (circle one)?

iii. A ste80*/STE80+ ste70*/ste70* diploid goes through meiosis to generate haploid cells. What fraction of the haploids can be used to determine order of function of the STE70 and STE80 genes? 1/2

iv. Draw the pathway of gene function in mating of STE70+ and STE80+ genes.



v. STE90* is dominant "always mating" mutant, and ste95* is a recessive "never mating" mutant. Discuss briefly if a diploid heterozygous for both genes would have a mating phenotype that is informative for determining the order of STE9+ and STE95+ gene function.

Not informative because diploid cell is not mutant for STE95 function.

2. True/False short statement. You must provide a relevant statement to get any credit for marking True or false. Do not simply restate the question in your statement. (20pt)

A. To generate useful DNA sequence, each reaction tube has three dioxynucleotide triphosphates and one dideoxynucleotide triphosphate (for example, dA, dC, and dG, and ddT). (Other substances are in the reactions as well that are not the subject of this question!).

False- you need some dT as well…otherwise get only very short products ending at first T.

B. Sequencing a human genome the second time will use the same strategy as used the first time.

False, the first time one set of "plasmid" primers were used for each different cloned sequences, while the second time ~10^6 primers to ~10^6 sequences will be used in uncloned DNA (1 example good enough)

C. A "reporter gene" as we discussed it in class is a genetic trick that allows us to determine when a genetic pathway is on or off.

True, for example the mating pathway induced FUS1 gene is fused to the HIS3 gene whose expression then indicates when the mating pathway is on.

D. The genomes of two species of zimbats, one from Hawaii and one from Alaska, were sequenced and found to be 10% heterologous (90% homologous). Dr. Bruce mated Hawaiian and Alaskan zimbats and found that the progeny were be sterile.

True- genomes that have more than ~3% heterology cannot undergo meiotic recombination because RecA requires >97% homology to carry out recombination. Thus viable gametes will not be generated in H/A zimbats.

E. A yeast diploid cell undergoes mitotic and meiotic recombination with equal frequencies.

False- mitotic cells undergo very little recombination- that only occurs as the result of error- while meiotic cells undergo a lot of recombination- because Spo11 protein that makes DNA breaks is made.