

Practice exam - Key topics: Chapters 11-13 MCDB 2222 February 2018 - Genetics (be able to explain)

- the gene and its "parts"
 - how do mutations of various types, in various sites within a gene, influence gene expression and the activity of the encoded gene product?
 - explain the difference(s) between haploid and diploid cells
 - chromosome behavior during the cell cycle
 - difference between sexual and asexual (somatic) reproduction
 - mutations and alleles - what is their relationship
 - factors controlling frequency of alleles within a population
- in a diploid organisms, define recessive / dominant / co-dominant alleles.
 - why are there no dominant alleles in haploid organisms?
- how do Muller's morphs relate to gene activity, phenotype, dominant and recessive behaviors
 - predict behavior in the presence of a deletion or duplication of a gene
 - how can a neomorphic mutation change a transcription factor
 - how can a strictly hypermorphic mutation arise?
 - predict the effects of a mis-sense mutation as a function of the (regional) conservation of a gene product
 - predict the relative effects of non-sense mutation in terms of position within a gene
 - What are the key check points in prokaryotic and eukaryotic cell cycle?
 - Explain why prokaryotic cell division is simpler than eukaryotic cell division.
 - how is bacterial conjugation similar to eukaryotic sex, how is it different.
- In what ways would a prokaryote benefit from horizontal gene transfer (in comparison to just eating foreign DNA)?
 - Why would a prokaryote use quorum sensing to decide whether to express the genes needed to import DNA?
- how does mitosis differ from meiosis? Which part of meiosis is most like mitosis, in what ways are they similar?
 - how (in what ways) are the cells existing from meiosis different from those that enter it?
 - why are differences in gene arrangements along a chromosome irrelevant during mitosis, but important in meiosis?
 - how can a chromosomal inversion or a reciprocal translocation lead to issues during meiosis or impact fertility?
 - why are centromeres important? What would be the effect of a defect in centromere function in mitosis? in meiosis?
 - What would you expect to happen during meiosis if homologous chromosomes did not align?
 - What are some of the effects of sexual dimorphism? live birth and extended dependence of maternal support (nutrition), as in mammals?
 - What is meant by genetic (genotypic) sex determination?
 - if you had to generate an environmental form of sex determination, what features might it share with genetic sex determination?
 - Predict the effects of various types of mutations on sex determination outcomes.
 - What are the advantages of sexual reproduction? in general and in terms of the generation evolutionary novelty?
 - How can you calculate the probability that alleles in two distinct genes, originally inherited together, will be separated by meiotic recombination?
 - How do alleles on the X chromosome differ in their effects between males and females (in mammals) and between different cells within the body?
 - What drives maternal and paternal imprinting (in mammals)? Would you expect imprinting in organisms that have external fertilization?