

Review Questions
Lectures 2 & 3

1. What are the two different types of natural genetic flow? Define each.
2. Which type of gene transfer occurs in bacteria? What about in sexually reproducing organisms?
3. During vertical transfer, what three processes can lead to a high degree of potential genetic variability of offspring? (Be sure to understand the details of each process and how they contribute to genetic variability.)
4. What are the five processes that can lead to new genes? List and define each.
5. Is there currently a natural cellular mechanism for the generation of brand new DNA (and, therefore, new genes)?
6. When does DNA shuffling occur? What functional outcome can occur when DNA shuffling combines two genes?
7. What is a gene family?

8. Explain how gene duplication and divergence can lead to gene families.

9. Can new gene families be created through duplication in the absence of divergence (i.e., no mutation)? Explain.

10. Explain why modularity of structure is common in proteins from the same gene family. (Be sure to understand what 'modularity of structure' means.)

11. What mechanisms can cause disruption or loss of existing genes? (Be sure to understand how each mechanism leads to loss.)

12. What is the most common source of DNA mutation?

13. List and define the four different types of DNA mutations.

14. Mutations that become part of the multicellular genome must occur in the cells of the germ line. *Why?*

15. Somatic mutations might affect the individual but cannot affect the population.
Why? (Hint: this question is actually redundant with question 14.)
16. Most organisms have low rates of mutation, but (unlike us) in bacteria these low mutation rates can result in high rates of evolution. *Why? (Hint: there are two reasons)*
17. What is ROS? (Where does it come from and what does it cause?)
18. What are transposable elements and how can they create new genes?
19. What is the sequence of generating a protein from a gene? Where is rRNA found? What about mRNA? Where does translation take place?
20. What is meant by “the genetic code has *redundancy*”?
21. Do any codons specify multiple amino acids?
22. Are any amino acids encoded by more than one codon? If so, how is this possible?
23. How many reading frames are there? When a mutation occurs that changes the reading frame of a gene it is called a _____ mutation. Why is it so important that a gene be read in frame?

24. Key players of translation: As mRNA is moved through the _____, its codons are translated into _____ one by one. _____ adds the amino acids to a growing polypeptide chain.

25. Describe the different structural organization of proteins (primary, secondary, tertiary, and quaternary structure).

26. What is the big difference between how secondary and tertiary structures are determined?

27. What is a protein domain?