Day 5 Review

Molecular Genetics

What You Must Know:

1. The structure of DNA
2. The knowledge about DNA gained from the work of Griffith; Avery, MacLeod, and McCarty; Hershey and Chase; Wilkins and Franklin; and Watson and Crick
3. Replication is semiconservative and occurs 5’ to 3’
4. The roles of DNA polymerase, ligase, helicase and topoisomerase in replication
5. The general differences between bacterial chromosomes and eukaryotic chromosomes
6. How DNA packaging can affect gene expression
7. How RNA and DNA are similar and different, and how this defines their roles
8. The differences between replication, transcription, and translation and the role of DNA and RNA in each process
9. How eukaryotic cells modify RNA after transcription
10. How genetic material is translated into polypeptides
11. How mutations can change the amino acid sequence of a protein and be able to predict how a mutation can result in changes in gene expression
12. Genes can be activated by inducer molecules, or they can be inhibited by the presence of a repressor as they interact with regulatory proteins or sequences
13. A regulatory gene is a sequence of DNA that codes for a regulatory protein such as a repressor protein
14. How the components of an operon function to regulate gene expression in both repressible and inducible operons
15. How positive and negative control function in gene expression
16. The impact of DNA methylation and histone acetylation on gene expression
17. How timing and coordination of specific events are regulation in normal development, including pattern formation and induction
18. The role of microRNA’s in control of cellular functions
19. The role of gene regulation in embryonic development and cancer
20. The components of a virus
21. The differences between lytic and lysogenic cycles
22. How viruses can introduce genetic variation into host organisms
23. Mechanisms that introduce genetic variation into viral populations
24. The terminology of biotechnology
25. How plasmids are used in bacterial transformation to clone genes
26. The key ideas that make PCR possible and applications of this technology
27. How gel electrophoresis can be used to separate DNA fragments or protein molecules
28. Information that can be determined from DNA gel results, such as fragment sizes and RFLP analysis
29. Discuss ethical implications of some applications of biotechnology
30. How prokaryotic genomes compare to eukaryotic genomes
31. Applications of bioinformatics to medicine, evolution and health
32. The activity and role of transposable elements and retrotransposons in generating genetic diversity
33. The role of homeotic genes and homeoboxes in developmental patterns and sequences