**AP Biology 12 Review Questions: Chapters 18-21 in Campbell**

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| **Chapter 18    Genetics of Viruses & Bacteria** |
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| The Genetics of Viruses |
| 1. | List and describe the structural components of viruses. |  |
| 2. | Explain why viruses are obligate intracellular parasites. |  |
| 3. | Explain how a virus identifies its host cell. |  |
| 4. | Distinguish between the lytic and lysogenic reproductive cycles, using phage lambda as an example. |  |
| 5. | Describe the reproductive cycle of retroviruses. |  |
| 6. | List some characteristics that viruses share with living organisms and explain why viruses do not fit our usual definition of life. |  |
| 7. | Describe the evidence that viruses probably evolved from fragments of cellular nucleic acids. |  |
| 8. | Describe viroids and prions. |  |
| 9. | Explain how transposable elements may cause recombination of bacterial DNA. |  |  |
| 10. | Distinguish between an insertion sequence and a transposon. |  |  |
| 11. | Describe the role of transposase in the process of transposition. |  |  |
| 12. | Explain the adaptive advantage of genes grouped into an operon. |  |  |
| 13. | Using the trp operon as an example, explain the concept of an operon and the function of the operator, repressor, and corepressor. |  |  |
| 14. | Distinguish between structural and regulatory genes. |  |  |
| 15. | Describe how the lac operon functions and explain the role of the inducer |  |  |
| 16. | Explain how repressible and inducible enzymes differ and how those differences reflect differences in the pathways they control. |  |  |
| 17. | Distinguish between positive and negative control and give examples of each from the lac operon. |  |  |

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|  | **Chapter 19    Eukaryotic Genomes** |
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|  | The Structure of Eukaryotic Chromatin 1.  Compare the structure and organization of prokaryotic and eukaryotic genomes. 2.  Describe the current model for progressive levels of DNA packing in eukaryotes. 3.  Explain how histones influence folding in eukaryotic DNA.The Control of Gene Expression. 4.  Describe at what level gene expression is generally controlled. 5.  Explain how DNA methylation and histone acetylation affect chromatin structure and the regulation of transcription. 6.  Define *epigenetic inheritance.* 7.  Describe the processing of pre-mRNA in eukaryotes.8.  Define *control elements*and explain how they influence transcription.9.  Distinguish between general and specific transcription factors.10. Explain the role that promoters, enhancers, activators, and repressors may play in transcriptional control.11. Explain how eukaryotic genes can be coordinately expressed and give some examples of coordinate gene expression in eukaryotes.12. Describe the process and significance of alternative RNA splicing.13. Explain how gene expression may be controlled at the translational and post-translational level.The Molecular Biology of Cancer14. Distinguish between proto-oncogenes and oncogenes. Describe three genetic changes that can convert proto-oncogenes into oncogenes.15. Explain how mutations in tumor-suppressor genes can contribute to cancer.16. Explain why a mutation knocking out the *p53* gene can lead to excessive cell growth and cancer. Describe three ways that *p53* prevents a cell from passing on mutations caused by DNA damage.17. Describe the set of genetic factors typically associated with the development of cancer.18. Explain how inherited cancer alleles can lead to a predisposition to certain cancers.Genome Organization at the DNA Level19. Describe the structure and functions of the portions of eukaryotic DNA that do not encode protein or RNA.20. Distinguish between transposons and retrotransposons.21. Using the genes for rRNA as an example, explain how multigene families of identical genes can be advantageous for a cell.22. Using a-globin and b-globin genes as examples, describe how multigene families of nonidentical genes may have evolved.23. Explain how exon shuffling could lead to the formation of new proteins with novel functions.  |
|  | **Chapter 20    DNA Technology** |
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| DNA Cloning |
| 1. | Explain how advances in recombinant DNA technology have helped scientists study the eukaryotic genome. |  |
| 2. | Describe the natural function of restriction enzymes and explain how they are used in recombinant DNA technology. |  |
| 3. | Explain how the creation of sticky ends by restriction enzymes is useful in producing a recombinant DNA molecule. |  |
| 4. | Outline the procedures for cloning a eukaryotic gene in a bacterial plasmid. |  |
| 5. | Describe techniques that allow identification of recombinant cells that have taken up a gene of interest. |  |
| 6. | Describe the polymerase chain reaction (PCR) and explain the advantages and limitations of this procedure. |  |
| 7. | Explain how gel electrophoresis is used to analyze nucleic acids and to distinguish between two alleles of a gene. |  |
| 8. | Explain how RFLP analysis facilitated the process of genomic mapping. |  |
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|   | DNA Analysis and Genomics |
| 9. | Explain the goals of the Human Genome Project. |  |  |
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|   | Practical Applications of DNA Technology |
| 10. | Describe how DNA technology can have medical applications in such areas as the diagnosis of genetic disease, the development of gene therapy, vaccine production, and the development of pharmaceutical products. |  |  |
| 11. | Explain how DNA technology is used in the forensic sciences. |  |  |
| 12. | Describe how gene manipulation has practical applications for environmental and agricultural work. |  |  |
| 13. | Explain how DNA technology can be used to improve the nutritional value of crops and to develop plants that can produce pharmaceutical products. |  |  |
| 14. | Discuss the safety and ethical questions related to recombinant DNA studies and the biotechnology industry. |  |  |

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|  | **Chapter 21    Genetic Basis of Development** |
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| 1. | Describe how genomic equivalence was determined for plants and animals. |  |  |
| 2. | Describe what kinds of changes occur to the genome during differentiation. |  |  |
| 3. | Describe the general process by which the ewe Dolly and the first mice were cloned. |  |  |
| 4. | Describe the characteristics of stem cells. Explain their significance to medicine. |  |  |
| 5. | Distinguish between determination and differentiation. Explain why determination precedes differentiation. |  |  |
| 6. | Describe how Drosophila was used to investigate the basic aspects of pattern formation (axis formation and segmentation). |  |  |
| 7. | Describe how homeotic genes define the anatomical identity of the segments of a developing organism. |  |  |
| 8. | Describe how apoptosis functions in normal and abnormal development. |  |  |
| 9. | Provide evidence of the conservation of homeobox patterns. |  |  |
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