Focus Questions
Genetics
Chapters 13-21
AP Biology

Focus Questions

Chapter 13
- Explain how genes are inherited in both asexually and sexually reproducing organisms. (13.1)
- How are chromosomes organized in human cells? (13.2)
- Compare and contrast the life cycles of animals, plants, and fungi. (13.2)
- Compare and contrast mitosis and meiosis providing specific examples. (13.3)
- Explain how independent assortment is achieved and what benefits it has. (13.4)
- Explain the process of crossing over in detail, and describe the benefits this process has. (13.4)
- Describe what is meant by random fertilization and describe the benefits it has. (13.4)
- Explain, with specific examples, what the evolutionary significance of genetic variation is. (13.4)

Chapter 14
- Explain Mendel's experiments and what specific ideas he was able to define related to genetics. (14.1)
- Explain how Mendel's experiments prove the Law of Segregation. (14.1)
- Explain how Mendel's experiments prove the Law of Independent Assortment. (14.1)
- What allows genetics to be predicted with the laws of probability? Explain. (14.2)
- What are some ways that genetics does not show traditional Mendelian inheritance patterns? (14.3)
- Explain how Tay-Sachs disease is inherited. (14.3)
- Describe how environmental factors can impact phenotypes. (14.3)
- Explain the phenotypic and genotypic characteristics of the following diseases: Cystic Fibrosis, Sickle-Cell Disease, Huntington's Disease, and Achondroplasia. (14.4)

Chapter 15
- Explain how the chromosomal theory of inheritance is described through the Law of Segregation and the Law of Independent Assortment. (15.1)
- Explain Thomas Hunt Morgan's experiments and what they tell us about inheritance. (15.1)
- Explain how sex is determined in various organisms. (15.2)
- Explain what a sex-linked gene is and give examples of disorders that are inherited in this way. (15.2)
- Explain what linked genes are, how it is determined that genes are linked, and how they can be used to determine a genetic map. (15.3)
- How can alterations of chromosome number and structure cause genetic disorders? Provide examples of disorders. (15.4)
- Describe specific ways genomic imprinting occurs. (15.5)
- What are extracellular genes, where are they found, and what are examples of traits they control? (15.5)

Chapter 16
- Explain how we know that DNA (and RNA) are the source of heritable information. (16.1)
- What is Chargaff's rule and what does it allow us to do? (16.1)
- What are the three models of DNA replication? Which one is correct? How do we know? (16.2)
- How does DNA replication differ in prokaryotes and eukaryotes? (16.2)
- How are mistakes in DNA replication repaired? (16.2)
- What is unique about replication at the ends of the DNA molecule how is the problem solved? (16.2)
- How is chromatin packed to form a eukaryotic chromosome? (16.3)

Chapter 17
- How are gene expressed? (17.1)
- Why is it significant about the universality of the genetic code? (17.1)
- Briefly describe the process of transcription. (17.2)
- Explain the significance of the 5' cap and poly-A tail. (17.3)
- How is RNA spliced and for what purpose is it spliced? (17.3)
- Briefly describe the process of translation. (17.4)
- What types of mutations can happen and how would it impact the structure of the protein? (17.5)
- After reading this chapter, how has your conception of a gene changed? What is your conception of a gene? (17.6)

Chapter 18
- In general terms, explain how genes are regulated? (18.1)
- How does an operon work and how can it be regulated? (18.1)
- What is positive gene regulation? (18.1)
- What is epigenetic inheritance, and what are examples? (18.2)
- How can transcription be regulated? (18.2)
- How is regulation accomplished post-transcription? (18.2)
- How can non-coding segments of RNA be used by a cell? (18.3)
- What are some ways different cell types are achieved in multicellular organisms? (18.4)
- What are the generalized steps of cancer development? (18.5)

Chapter 19
- What is the basic structure of a virus? (19.1)
- Explain the tobacco mosaic disease experiment and what was learned from it. (19.1)
- Briefly explain viral replication including discussion of the lytic and lysogenic phases. (19.2)
- Explain replication of a retrovirus and provide an example. (19.2)

Chapter 20
- Briefly explain how genes are cloned using restriction enzymes. (20.1)
- Explain what a genomic library is and how it can be used. (20.1)
- How does the polymerase chain reaction work and how is it used? (20.1)
- Explain the process of gel electrophoresis and applications for its use. (20.2)
- Explain a microarray assay and potential uses. (20.2)

Chapter 21
- What is bioinformatics and what resources are available for analyzing genomes? (21.2)
- What are transposable elements and what impact can they have on a genome? (20.4 & 21.5)
- Briefly explain several ways genomes can evolve. (21.5)

Key Terms

Chapter 13

alternation of generations
asexual reproduction
autosome
chiasma
clone
crossing over
diploid cell
fertilization
gamete
gametophyte
gene
genetics
haploid cell
heredity
homologous chromosomes
karyotype
life cycle
locus
meiosis
recombinant chromosome
sex chromosome
sexual reproduction
somatic cell
spore
sporophyte
synapsis
tetrad
variation
zygote

Chapter 14

addition rule
allele
amniocentesis
carrier
character
chorionic villus sampling (CVS)
codominance
complete dominance
dihybrid
dominant allele
epistasis
F1 generation
F2 generation
genotype
heterozygous
homozygous
hybridization
incomplete dominance
law of independent assortment
law of segregation
monohybrid
multiplication rule
P generation
pedigree
phenotype
pleiotropy
polygenic inheritance
recessive allele
testcross
trait
true-breeding

Chapter 15

aneuploidy
Barr body
chromosome theory of inheritance
crossing over
deletion
duplication
genetic map
genetic recombination
genomic imprinting
hemophilia
inversion
linkage map
linked genes
map unit
nondisjunction
parental type
polyploidy
recombinant
X-linked gene
translocation
wild type

Chapter 16

antiparallel
DNA ligase
DNA polymerase
DNA replication
double helix
helicase
lagging strand
leading strand
mismatch repair
nuclease
nucleotide excision repair
Okazaki fragment
origin of replication
phage
primase
primer
replication fork
semiconservative model
single-strand binding protein
telomerase
telomere
topoisomerase
transformation
virus

Chapter 17

5' cap
alternative RNA splicing
anticodon
codon
deletion
exon
frameshift mutation
gene expression
insertion
intron
messenger RNA (mRNA)
missense mutation
mutagen
mutation
nonsense mutation
nucleotide-pair substitution
point mutation
poly-A tail
promoter
ribosomal RNA (rRNA)
RNA polymerase
RNA splicing
silent mutation
TATA box
terminator
transcription
transcription factor
transfer RNA (tRNA)
translation

Chapter 18

activator
alternative RNA splicing
cyclic AMP (cAMP)
determination
differentiation
DNA methylation
embryonic lethals
enhancer
epigenetic inheritance
histone acetylation
homeotic genes
inducer
induction
maternal effect gene
microRNAs
morphogenesis
oncogene
operator
operon
p53 gene
positional information
proto-oncogene
ras gene
regulatory gene
repressor

Chapter 19

AIDS
bacteriophages
capsid
epidemic
HIV
lysogenic cycle
lytic cycle
pandemic
phages
prions
prophages
retroviruses
restriction enzyme
reverse transcriptase
vaccine
viroids
virus

Chapter 20

biotechnology
complementary DNA (cDNA)
DNA microarray assay
gel electrophoresis
gene cloning
gene therapy
genetic engineering
genetically modified organism
genomic library
in situ
in vitro
pluripotent
polymerase chain reaction (PCR)
plasmid
recombinant DNA
restriction enzyme
stem cell
sticky end
totipotent
transgenic

Chapter 21

bioinformatics
genomics
Human Genome Project
linkage map
transposable elements
transposons