AP Bio Unit 4: Mitosis, Meiosis & Theoretical/Mendelian Genetics

Test Study Guide

**I. Multiple Choice & Short Answer: Bulleted Lists**

1. Cell Division:
2. Cell cycle:
3. explain the importance of surface area to volume ratio & how that relates to movement/exchange of materials for the cell
4. parts of the cell cycle
5. list all the different stages
6. outline what happens in each of the stages
7. Nuclear Division:
8. explain the process & results of mitosis

1) make sure to include: supercoiling of chromosomes, spindle microtubules, centromeres, kinetochores, splitting of centromeres, sister chromatids, absorption & re-formation of nuclear membranes & nucleoli

1. give at least 4 places where mitosis is involved in the life of an organism
2. Cytoplasmic Division:
3. differentiate the process in animal cells vs. plant cells

(structurally & process wise)

1. Meiosis:
2. Outline the different phases and stages of meiosis

a. make sure to include: homologous chromosomes/homologues, tetrad, bivalents, synapsis, crossing over, chiasmata, genetic diversity, diploid, haploid and non-sister chromatids in this discussion

1. Relate non-disjunction of homologues to specific genetic trisomy examples & changes in the Karyotype of an organism
2. Relate to Mendel’s Principle of Independent Assortment & Principle of Segregation
3. State 2 ways that the processes *within* meiosis results in effectively an infinite genetic variety
4. Chromosomes et. al.:
5. describe the structural relationships between chromatin, chromosomes, and sister chromatids
6. relate the following terms: gene, allele, genome
7. state what a mutation is
8. Karyograms & Karyotypes:
9. process for collecting chromosomes (ex. how collect fetal cells)
10. what can tell from resulting karyotype
11. Theoretical Genetics:
12. Mendel’s Principles:

a. what are they, where are they seen in meiosis, and what can occur that shows that these principles are not met

1. Gene Loci:
2. define & be able to construct a chromosome map
3. be able to calculate crossover rate (recombinance) using given data to determine if genes for two traits are linked
4. define gene linkage
5. Be able to define and relate the following terms: genotype, phenotype, dominant allele, recessive allele, codominant alleles, locus/loci, homozygous, heterozygous, carrier, test cross, gene linkage, autosomome/autosomal, sex chromosome
6. 8 patterns of inheritance: (major 6 + 2 others….)
7. state each & define each pattern
8. describe an example for each of the patterns of inheritance
9. be sure to include (but are not limited to): skin colour in humans, haemophilia, colour blindness, human blood type, sickle cell disorder, snapdragon flower colour, genetic rickets, chicken feather colour, etc
10. Prediction of offspring
11. Monohybrid crosses:
12. complete & label all 5 parts
13. predict genotypic & phenotypic ratios using different autosomal chromosomes
14. Sex-linked crosses:
15. complete & label all 6 parts
16. predict genotypic & phenotypic ratios using different sex chromosomes
17. be able to complete both sex-linked recessive & sex-linked dominant crosses with examples
18. Dihybrid crosses:
19. complete & label all 5 parts
20. predict genotypic & phenotypic ratios of offspring
21. Pedigrees
22. differentiating male and female
23. labeling generations and individuals with Roman & Arabic numerals
24. deducing pattern of inheritance from pedigree
25. deducing genotypes of individuals based on reported phenotypes
26. **Short Answer: Paragraphs**
27. What are the 3 patterns of inheritance that human blood type expresses? Describe where each of the 3 patterns are expressed. Predict the genotypes and phenotypes of offspring of a phenotypically type A blood human with a type AB human. Make sure to label & show all work.
28. What makes a trait sex-linked? Give an example of a recessive and a dominant sex-linked trait in humans. Predict the genotypes and phenotypes of the offspring for specified parental generation.
29. What is a gene loci? What is gene linkage? What do you calculate to determine if there is gene linkage & what is the equation (you will be given specific data on the exam to use to do this calculation)? What principle by Mendel does not apply in cases of gene linkage? Explain how this principle is not met.
30. **Essay:**
31. Who is considered the “father of heredity”? Describe who he was, where & when he lived, what he studied, why these organisms would be an excellent choice for study. Additionally, what two principles/”laws” that he came up with after years of data collection? Even though he did not know about genes & alleles, give examples of where these two principles occur normally in a cell cycle.

Describe the actions that happen & when they happen during meiosis that corroborate both of Mendel’s principles/”laws”. Then talk about what changes to the meiosis process that cause these principles to not be science “laws” but principles due to failure of certain things that happen.

Finally, complete the following Dihybrid cross to support where these two principles are expressed: cross a self-pollinating heterozygous purple flower tall pea plant, being sure to show the chromosomes in your cross.

1. **Test Format:**
2. Multiple Choice & Short Answer: Bullets 30pts
3. Short Answer: Paragraphs 20pts
4. Essay 20pts

TOTAL = 70pts