

Calvin and Hobbes by Bill Watterson



Fall 2004
Animal Science 213 Animal Genetics

EXAM 2

125 Points

Exam **must be completed in INK!**

Name: _____

Multiple Choice (4 points each)

1. Mutations may be
 - a. Beneficial
 - b. Detrimental
 - c. **XBoth**
 - d. Neither
2. The most likely mutation arising from intercalating agents are
 - a. Deletions
 - b. Insertions
 - c. Frameshift mutations (ALSO ACCEPTED)
 - d. **XAll of the above**
 - e. None of the above
3. Topoisomerases are enzymes that control _____ in bacteria
 - a. Recombination
 - b. **XSupercoiling**
 - c. Reverse mutation
 - d. Proofreading

4. When histones are acetylated, DNA wrapped around those histones is
 - a. XMore transcriptionally active
 - b. Less transcriptionally active
 - c. Recombinant
 - d. Translated

5. The genes encoding the RNA molecules that are a part of the ribosome structure are good examples of what kind of gene?
 - a. Nonsense genes
 - b. Heterochromatin
 - c. Genes that are not transcribed
 - d. XMulticopy genes

6. Dr. Barbara McClintock won a Nobel Prize for her work describing
 - a. Mutations in Drosophila
 - b. XTransposable elements
 - c. Satellite DNA
 - d. None of the above

7. If an organism has a normal diploid number of 44, how many chromosomes will be present in each non-dividing, somatic cell if it is euploid?
 - a. 43
 - b. X44
 - c. 45
 - d. 46

8. If an organism has a normal diploid number of 44, how many chromosomes will be present in each non-dividing, somatic cell if it is monosomic?
 - a. X43
 - b. 44
 - c. 45
 - d. 46

9. Non-disjunction may occur during
 - a. Anaphase I
 - b. Anaphase II
 - c. XEither a or b
 - d. Neither a nor b

10. A unisexual organism has which of the following sexual organs?
 - a. XEither female or male
 - b. Both female and male
 - c. Different organs at different life stages
 - d. The organism reproduces asexually

11. Cri-du-Chat syndrome is a syndrome that arises as a result of which kind of chromosomal abnormality?

- a. Translocation
 - b. Pericentric inversion
 - c. Paracentric inversion
 - d. XPartial deletion
12. People with Xeroderma Pigmentosum lack which of the following DNA repair mechanisms?
- a. Mismatch repair
 - b. Proofreading enzymes
 - c. Double strand break repair
 - d. XExcision repair
13. On a polytene chromosome, puffs are areas characterized by
- a. Translational activity
 - b. XTranscriptional activity
 - c. Lack of translational activity
 - d. Lack of transcriptional activity
14. Rearrangement of chromosomes may cause genes to be suppressed or activated. This is referred to as the _____ effect.
- a. Mutational
 - b. Translocational
 - c. Preferred
 - d. XPositional
15. An individual who has an extra copy of chromosome 5 would be referred to as
- a. XAneuploid
 - b. Euploid
 - c. Triploid
 - d. Polyploid
16. Familial Down Syndrome is an example of which kind of chromosomal rearrangement?
- a. Pericentric inversion
 - b. Paracentric inversion
 - c. XTranslocation
 - d. Reciprocal Translocation
17. A human female with Turner Syndrome also expresses the X-linked trait hemophilia, as does her father. Which parent underwent non-disjunction during gamete formation?
- a. Father
 - b. Xmother (The key was marked wrong; I gave everyone credit)
 - c. Both
 - d. Neither

5'GA^mTCGGCTACATG3'
3'CT AGCGGATGTAC5'

18. Above is a stretch of newly replicated DNA that contains a mismatch. When the mismatch is repaired, what will the correct sequence be?
- 5'GA^mTCGCCTACATG3'
 - 3'CT AGCGGATGTAC5'
 - X3'CT AGCCGATGTAC5'
 - none of the above; write the correct sequence here_____.
19. A heterogametic individual would have the following sex chromosome arrangement:
- XXY
 - XX
 - XXX
 - X

True/False (1 point each)

20. ___T___ Satellite DNA is highly repetitive
21. ___T___ The more repetitive DNA included in a genome, the more quickly it will reanneal after being denatured.
22. ___T___ For most diploid eukaryotic organisms, sexual reproduction is the only mechanism resulting in new members of a species.
23. ___T___ In *C. elegans*, the male phenotype is determined by the presence of one X chromosome.
24. ___T___ If a human is monosomic X, the individual will be female.
25. ___T___ Tautomers are structural isomers of the nitrogenous bases in DNA and RNA.
26. ___T___ Telomeres contain repeat sequences
27. ___T___ Long interspersed elements may be present up to 100,000 times in a single mammalian genome.
28. ___T___ The biotechnology industry is a byproduct of the human genome project.
29. ___F___ An individual inherits unique genes for each antibody used to fight foreign invaders in that individual's lifetime.
30. ___T___ The Ames test for mutagenicity relies on reverse mutation.

Sentence completion/Fill in the blank (2 points per blank or answer)

31. Presence of ovaries vs. testes is the **primary**/secondary (circle one) sex characteristic of an individual.

32. Chromosomes in which portions have become reversed are referred to as having undergone an inversion.

33. Fragile X Syndrome occurs in fetuses of women who were deficient in vitamin B/folic acid during pregnancy.

34. Lampbrush chromosomes are present during meiosis (genetic process or event).

35. Any change in the chemical composition of DNA is a mutation.

36. An alteration in the DNA composition that is not passed on to the subsequent generation is referred to as somatic, while those that can be passed on are referred to as gametic.

37. An alteration in the DNA composition that is only expressed under certain circumstances (e.g. temperature) is referred to as conditional mutation.

38. A tautomer of thymine will pair with guanine (the word, not the letter).

39. **Intercalating agents cause frameshift mutations in DNA sequences.**

40. Ultraviolet light causes the formation of thymine dimers in DNA sequences.

41. Cells in the M or mitotic phase of the cell cycle are most likely affected by high energy radiation.

Short Answer (points indicated by each number)

42. (4 points) Other than simply sequencing the human genome, list two goals of the human genome project.

Identify effects of radiation

Identify the ~30,000 genes in human DNA

Determine the sequences of the 3 billion bases of the human genome

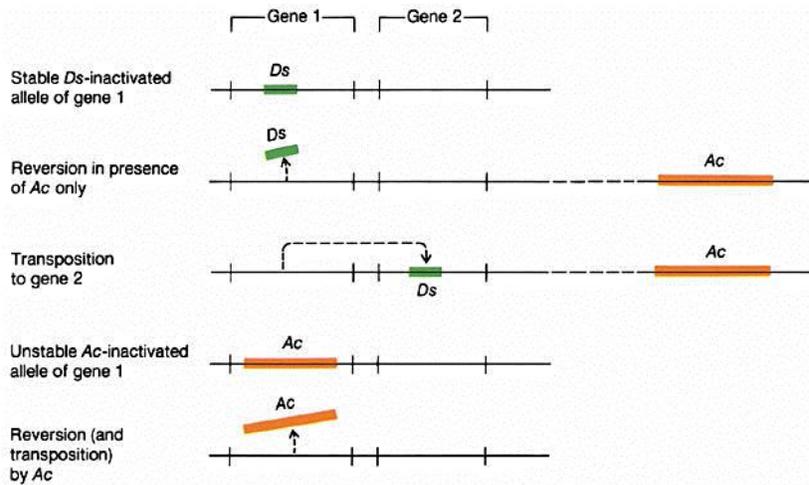
Develop databases to store and access this information

Improve tools for data analysis

Transfer related technologies to the private sector

Address the ethical, legal and social issues that would arise from the project

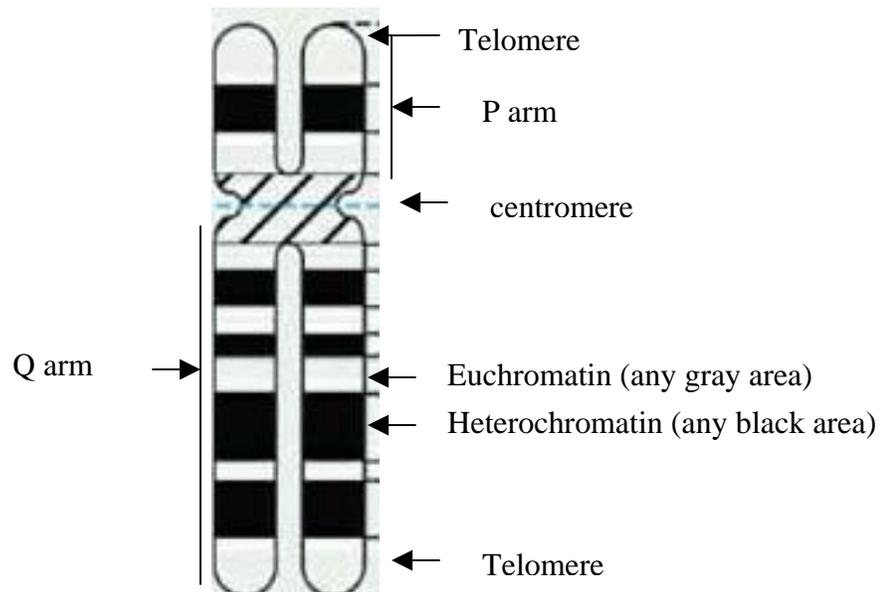
43. (4 points) In the Ac-Ds system, if there are two genes in line and the first contains the Ds mutation, explain or draw how the Ds mutation can be fixed in the first gene and added to the second gene.



-Ac must be present for Ds to be moved.
 -Ac is responsible for movement of DNA/removal of the Ds mutation from gene 1 to gene 2.

46. (6 points) On the chromosome below, label the following:

- Centromere
- Heterochromatin
- Euchromatin
- P arm
- Q arm
- Telomeres



Bonus Questions (2.5 points each)

- A. Below is a C_0t curve for the genome of a newly discovered organism. What can you infer from the shape of the curve?

The *slow rate* of reannealing indicates that the genome is largely unique.

- B. Below is a graph indicating the percentage of male snapping turtles and lizards. In some reptiles, sex determination occurs at a specific time during embryonic development and is dependent on the temperature at that specific time. Based on the graphs:
- What is the optimum temperature for male determination in snapping turtles? **~30%**
 - Is sex determination temperature dependent in lizards? **No**
 - At 25° C, what would be the approximate percentage of female snapping turtles? **~80% female, 20% male**