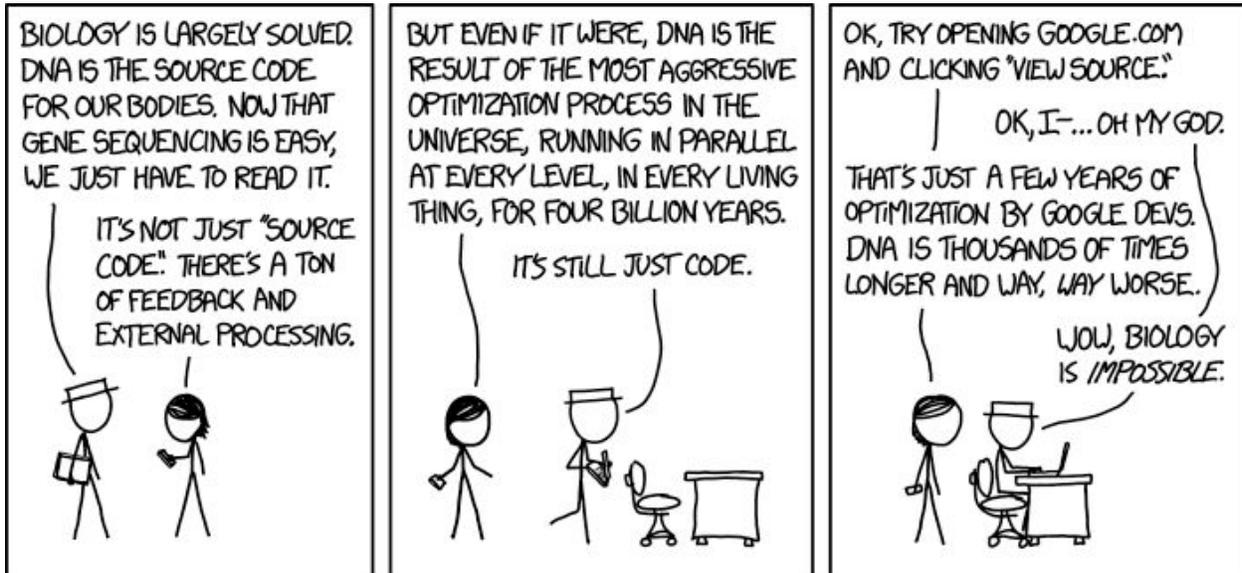


Designer Genes C Practice Test

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Time limit: 50 minutes

Resources: 2 non-programmable calculators & 1 sheet of notes

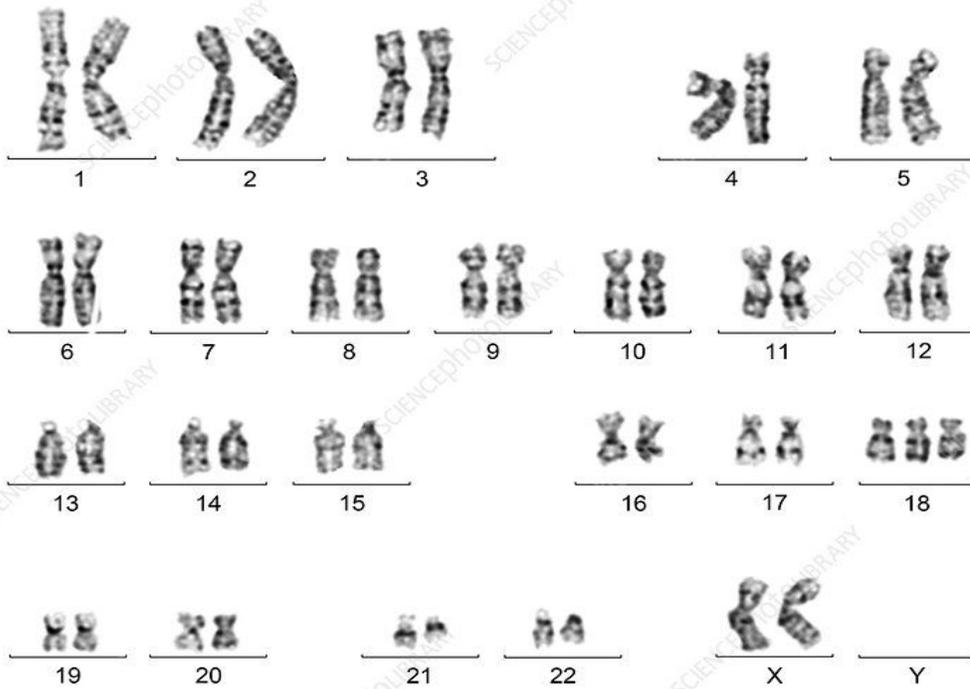
Names: _____ Score: ____/87

School & Team #: _____

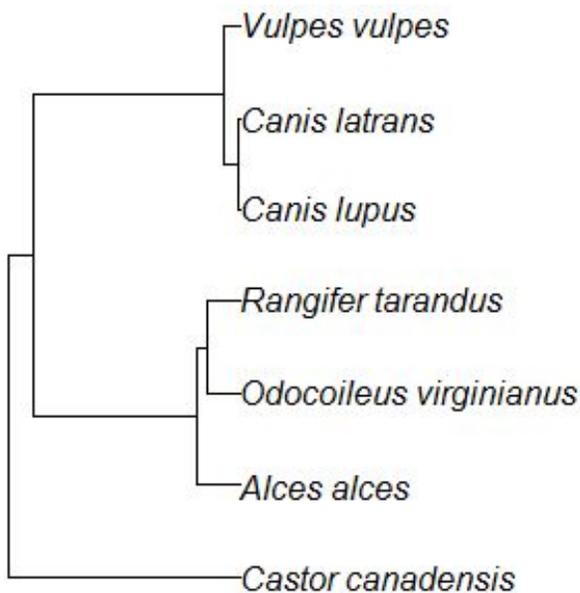
Section 1: Multiple Choice Questions & Fill in the Blank (2 pts each)

1. Bob decides to do DNA gel electrophoresis. After running the gel, he starts to stain it. What dye should he use?
 - a. Coomassie Blue
 - b. Ethidium bromide
 - c. Crystal Violet
 - d. Safranin
 - e. Acridine Orange
2. Adenine is 13% of DNA. What is the percentage of Guanine in the cell?
 - a. 13%
 - b. 26%
 - c. 37%
 - d. 74%
 - e. 87%

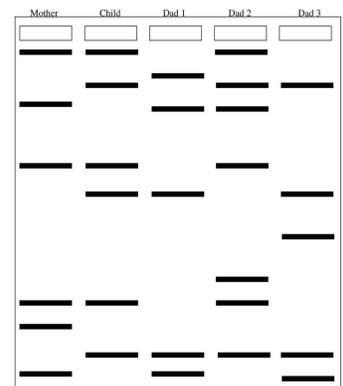
3. A female has trisomy X. How many barr bodies will she have in her somatic cells?
 - a. 0
 - b. 1
 - c. 2
 - d. 3
 - e. 4
4. 1 in 3500 newborns have Tay Sachs disease. Calculate the frequency of carriers in the population. **1/29 5 points**
5. When do chromosomes condense during prophase I of meiosis?
 - a. Diakinesis
 - b. Diplotene
 - c. Zygotene
 - d. Leptotene
 - e. Pachytene
6. There are two true breeding peas with the following traits: one has purple flowers, and produces green and round seeds, while another pea has white flowers, and produces yellow and wrinkled seeds. P is for purple flowers, G is for green seeds, and R is for rounded seeds. They cross to produce an F1 generation, and then are bred again to produce an F2 generation. Calculate the probability of producing a flower with the genotype PpggRR in the F2 generation. **1/32 5 points**



7. What syndrome does this person have?
 - a. Down Syndrome
 - b. Edward's Syndrome
 - c. Klinefelter's Syndrome
 - d. Turner's Syndrome
 - e. Edward's Syndrome
8. Based on the karyotype in question 7, what gender is this person?
 - a. Female
 - b. Male
9. In what phase of meiosis are pictures taken of the chromosomes for karyotypes?
 - a. Prophase
 - b. Cytokinesis
 - c. Anaphase
 - d. Metaphase
 - e. Telophase
10. What enzyme is used to join okazaki fragments together?
 - a. DNA gyrase
 - b. Topoisomerase
 - c. DNA polymerase I
 - d. DNA ligase
 - e. DNA polymerase III

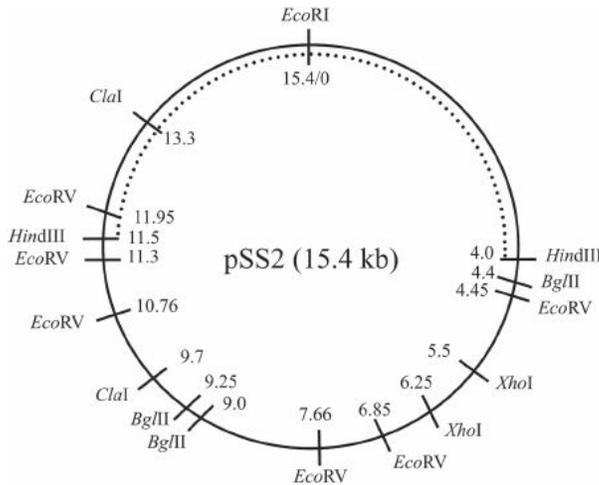


11. Above is a phylogenetic tree containing a few mammalian species. What relationship does *Canis latrans*, *Canis lupus* and *Rangifer tarandus* have?
- They are a monophyletic group
 - They are a paraphyletic group
 - The are a polyphyletic group
 - None of the above
 - All of the above
12. Which of the following promotes chromatin condensation?
- Acetylation
 - Methylation
 - Phosphorylation
 - A and B
 - All of the above
 - None of the above
13. Which of the following refers to ABO blood types?
- Incomplete dominance
 - Sex-linked
 - Co-dominance
 - Multiple alleles
 - A and B
 - B and C
 - C and D
 - All of the above
 - None of the above
14. Which of the following is the most common cause of thymine dimers?
- Chemicals
 - Sleep deprivation
 - UV light
 - Toxins
15. Refer to the DNA agarose gel electrophoresis RFLP analysis. Who is the father of Juliet's child?
- Dad 1
 - Dad 2
 - Dad 3
 - A secret lover not shown



16. David has mitochondrial myopathy. His mother and grandmother also has this disease. Why is this? Explain in terms of fertilization. **5 points**
 (answers may vary) The egg cell contributes all organelles at fertilization whereas the sperm contributes only genetic material. Therefore, the mother passes on mitochondrial DNA.

17. Which restriction enzyme should be used? The gene of interest is dotted.



HindIII (3 pt)

18. Barr bodies are created in many animals. The gene, **XIST**, is activated in order to condense the X chromosome into a barr body. Another gene, **TSIX**, is activated on the other X chromosome in order to prevent condensation into a barr body. **2 each**

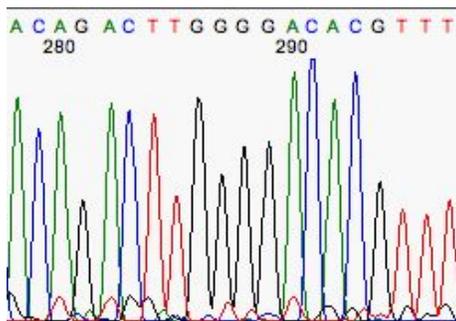
19. True/**False**: The terminator sequence is found in eukaryotes. **2 pt**

20. The enzyme **telomerase** lengthens telomeres in eukaryotic **germ** cells.

21. The promoter DNA sequence **TATA box** is crucial in forming the initiation complex at a eukaryotic promoter.

22. True/**False**: Bacterial chromosomes have many origins of replication. **2 point**

23. Write out the DNA strand for the following. **(4 points, all or nothing)**



24. Define each of the following: nucleotide-pair substitution, silent mutation, missense mutation, frameshift mutation

12 points, 3 per definition (answers may vary):

- Nucleotide-pair substitution: a pair of nucleotides is substituted by another pair
- Silent mutation: a mutation that does not change an amino acid
- Missense mutation: a mutation that causes a change in the amino acid sequence
- Frameshift mutation: a deletion or insertion that shifts the DNA sequence reading frame and thus the amino acids of the protein

25. Describe the 3 steps of PCR.

12 points, 4 per step, 1 pt for name & 3 for description:

1. Denaturation: Heated so that DNA strands come apart
2. Annealing: Temperature comes down so that primers can bind to DNA
3. Elongation: Nucleotides bind to each single DNA strand

26. What is the role of dideoxynucleotides in Sanger sequencing?

3 points: To terminate DNA sequences at different lengths