

ANSWER KEY for Stephen F. Austin HS' captain exchange Designer Genes 2019-20:
MC (point values assigned on test):

1. B
2. A
3. B
4. B
5. A
6. C
7. D
8. D
9. A
10. D
11. C
12. D
13. D
14. D
15. B
16. E
17. C
18. B
19. D
20. E
21. B
22. A
23. D
24. D
25. E
26. A
27. D
28. C
29. C

Short Answer:

30. (1pt/letter) a) C b) E c) B, D d) A
31. (2pts/genotype) HhSs and hhSs
32. (4) 6.25%
33. A) (1) Klinefelter's b) (1) Male c) (2) Metaphase d) (2) Giemsa
34. A) (3) Wolf-Hirschhorn syndrome b) (1) Yes; (3) she's female.
35. A) First filarial B) Cytosine-phosphodiester (bond)-Guanine c) Aminoacyl-tRNA & peptidyl-tRNA d) chloroplast Deoxyribonucleic acid (1/2 credit for not spelling out DNA) e) Restriction Fragment Length Polymorphism f) Variable Number Tandem Repeats g) Polymerase Chain Reaction h) Clustered Regularly Interspaced Short Palindromic Repeats
I) di-deoxynucleotide triphosphates j) Whole Transcriptome Shotgun Sequencing k) Transposon Sequencing l) Short/small hairpin ribonucleic acid (1/2 credit for not spelling out RNA) m) single strand Binding proteins

36. A) Denaturation, Annealing, Extension/elongation b) adaptation/spacer acquisition, expression/crRNA biogenesis, interference c) G1, S, G2 d) Initiation, Elongation, Termination
37. A) DNA Replication is semi-conservative b) Developed DNA fingerprinting based on minisatellite variability c) Won a Nobel prize for her work on telomeres d) Invented PCR e) First to isolate nucleic acids f) Discovered DNA structure, helped discover DNA is transcribed via 3-nucleotide sets called codons (need both or else half credit) g) Created first genetically engineered organism w/ recombinant DNA (bacteria w/ plasmid) h) Discovered and named CRISPR in prokaryotes
38. (1) CCR5; (3) to prevent HIV infection
39. (2/reason) Multiple codons can go to one AA, alternative splicing, UTRs/promoters not included, Introns removed, Mutation, OPA.
40. A) (3) Forgot to fluorescently dye the DNA segments so they don't show up on X-Ray film b) (3) Not expected, because it indicates that the normal cells have higher levels of gene expression than the cancer cells, which is weird b/c usually vice versa.
41. Prokaryotes: any two of the following: no introns, less codons per gene, genes are closer together, genome smaller
42. (1) 61; (3) wobble base pairing some tRNA anticodons can bind to more than one codon (U=G)
43. (2) Taq polymerase is highly heat-resistant; (2) can be used w/ small/impure samples of DNA to perform things like DNA fingerprinting, making many copies of DNA for analysis/testing, mutagenesis, OPA (NOTE: simply stating that it makes billions of copies does NOT get credit)
44. (2) Shine-Dalgarno Sequence; (2) N-formylmethionine (note: NO CREDIT FOR METHIONINE)
45. A) (1) one of the two: make less negative, make sample longer; b) (2) A & B (Hoe Joe & Thicc Nic)
46. (3) Environmental factors like smoking can create epigenetic marks with negative effects, and since a small portion of epigenetic marks can escape reprogramming, it can pass on to offspring. OPA but less points will be awarded.
47. (1) Fundamentally different, (3) because Histone Acetyltransferase transfers an acetyl-coA to histones, removing the positive charge and relaxing DNA structure, increasing transcription levels. Methyltransferase suppresses gene expression by the transfer of a methyl group onto regions of DNA, such as promoters. (HALF CREDIT for: Fundamentally similar, because both regulate gene expression)

Long Answer/Free Response:

48. a) (3pts) 75% b) (4pts) Z*W & ZW; (3pts) any one of the following: fewer offspring will develop/survive, 1/4 of the offspring are predicted to die, some of her offspring will have the Z* chromosome/all of the male offspring will have a Z* chromosome
49. a) Genes for Cuteness and Fur Color are NOT linked.
Part b) 18 Black, Cute dogs; 6 Black, ugly dogs; 6 brown, Cute dogs; 2 brown, ugly dogs
a) 16.22 (WORK NEEDS TO BE SHOWN)
b) Genes are linked (1), because $16.22 > 7.815$ (which is DoF 3, $p = .05$)
50. A) (3) A, B, C, E, F, G, H (all or nothing)
b) Deamination (1), loss of amine group from cytosine turns it into Uracil (2)
a) MetIle (1pt for Met, 1pt for I, 1pt for Ile)

b) (2) Earlier on (more codons/AA are affected)