

## **Designer Genes C Practice Exam KEY**

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Answer Key:

Multiple Choice

1. E
2. B
3. D (because the true cause is X-Inactivation)
4. B
5. C
6. C
7. C
8. B
9. B
10. A
11. E
12. B
13. A
14. D
15. D
16. D
17. B
18. A
19. C
20. D
21. B
22. D
23. A
24. C
25. E (RNA Primers!)
26. C
27. C
28. B
29. B
30. C

Part B. Short Answers:

31. Asexual (1), because identical DNA (1)
32. 1 viable egg (1), 3 polar bodies (1)
33. Neurons (2)
34. Shine-Dalgarno Sequence (3)
35. Klinefelter's (1), male (1)
36. Part a) Cri Du Chat Syndrome (2), deletion of p arm of chromosome (2)  
Part b) Giemsa (2)
37. Consanguineous Mating (2)
38. Heterozygote advantage (1), sickle cell protects an individual from malaria (3)
39. tRNA (2), U=G (2)
40. Sanger Sequencing (2)
41. Independent Assortment (2)
42. Bacteria do not have the enzymes to remove introns, and introns must be removed (3)
43. A polylinker includes multiple restriction sites, which means multiple restriction enzymes can be used (3)
44. Never, do not (any synonyms acceptable) (2)

45. It means that the cancerous tissue are expressing genes at a higher level than non-cancerous ones (3). This probably means they are growing faster, out of control, and amplifying cell processes. (2)
46. WTSS- Whole Transcriptome Shotgun Sequencing (1); advantages include but are not limited to: can investigate new mRNA/genes (do not have to know sequence before testing), low background signal (signal-to-noise advantage), ability to quantify large dynamic range of expression levels with absolute rather than relative levels, analyze post-transcriptional alternations, more accepted if logical
47. Part a) Restriction fragment Length Polymorphism (1)  
Part b) Sir Alec Jeffreys (1)  
Part c) Make it shorter (1), make it more negative (1)  
Part d) A (1) and B (1)
48. Part a) Clustered Regularly Interspaced Short Palindromic Repeats (1)  
Part b) Spacer Acquisition (1), crRNA biogenesis or Expression (1), Interference (1)  
Part c) Francisco Mojica (1)  
Part d) Bacterial defense system against invading viral bacteriophages; cleaves complementary segments (2)  
Part e) Creating designer babies, visualizing genomes, possibly slow/stop aging, etc. More correct answers accepted if logical. Only one answer counts for credit. (2)
49. CCR5 gene (2); prevent contracting HIV (2)
50. They are responsible for spacer acquisition (3)

Part C. Long Answer.

51. Part a) The genes for Happiness and Fur Color are NOT linked. (2)  
Part b) 18 Black, Happy rabbits; 6 Black, sad rabbits; 6 white, Happy rabbits; 2 sad, white rabbits (1 each)  
Part c) 16.22 (5)  
Part d) These genes are linked (1), because  $16.22 > 7.815$  (which is Degrees of Freedom 3,  $p=0.05$ ) (3)
52. Reasons include but are not limited to: Epigenetics/marks (environmental factors), Epistasis, Late Development (genotype does not show up until later, ie baldness), Mutation, etc. More answers accepted if logical. (3 each)
53. CpG Islands are regions of DNA where the frequency of the CG sequence is higher than usual, where "p" represents the phosphodiester bond between them (2); usually found near promoter regions of housekeeping genes (2); methylation is adding a methyl group to a nucleotide which suppresses expression (2); it is related to CpG islands because methylated Cytosine can be converted into Thymine by accidental deamination, so methylation decreases the frequency of the CG sequence (2)
54. Coding strand- ATG GCT ACC  
mRNA- AUG GCU ACC  
tRNA- UAC CGA UGG  
Amino Acid sequence- Methionine Alanine Threonine  
(2pts per line)
55. a) A, C, E (2- all or nothing)  
b) Deamination (1)- loss of amine group from cytosine turns it into Uracil (2)  
c) Mutagens are chemical or physical agents that cause mutation (1); UV light, harmful chemicals, etc. (1)  
d) Original: methionine Leucine Serine Tyrosine New: Methionine Alanine STOP (.25 each)  
e) Later, because less codons are affected (2)