

**Answer Key (Captains Test: Designer Genes 2020 (Division C))**

- 1) C [1]
- 2) C [1]
- 3) Polygenetic inheritance [1]
- 4) Epistasis [1]
- 5) Codominance [1]
- 6) Complete dominance [1]
- 7) Polygenetic inheritance [1]
- 8) Incomplete dominance [1]
- 9) Pleiotropy [1]
- 10) Epistasis [1]
- 11) B [1]
- 12) D [1]
- 13) E [1]
- 14) D [1]
- 15) A [1]
- 16) A [1]
- 17) D [1]
- 18) C [1]
- 19) B [1]
- 20) D [1]
- 21) A [1]
- 22) B [1]
- 23) C [1]
- 24) E [1]
- 25) Leptotene [1]
- 26) Zygotene [1]
- 27) Pachytene [1]
- 28) Diplotene [1]
- 29) Diakinesis [1]
- 30) C [1]
- 31) B [1]
- 32) E [1]
- 33) D [1]
- 34) C [1]
- 35) B [1]
- 36) E [1]
- 37) A [1]
- 38) B [1]
- 39) Telomerase [1]

- 40) Nuclease [1]
- 41) Ligase [1]
- 42) DNA polymerase III [1]
- 43) Helicase [1]
- 44) DNA polymerase I [1]
- 45) Topoisomerase [1]
- 46) Primase [1]
- 47) A [1]
- 48) B [1]
- 49) A [1]
- 50) D [1]
- 51) B [1]
- 52) D [1]
- 53) A [1]
- 54) B [1]
- 55) E [1]
- 56) C [1]
- 57) B [1]
- 58) D [1]
- 59) E [1]
- 60) C [1]
- 61) Silent mutation [1]
- 62) Nonsense mutation [1]
- 63) Missense mutation [1]
- 64) Frameshift mutation [1]
- 65) A [1]
- 66) C [1]
- 67) C [1]
- 68) C [1]
- 69) A [1]
- 70) A [1]
- 71) E [1]
- 72) D [1]
- 73) B [1]
- 74) C [1]
- 75) E [1]
- 76) D [1]
- 77) C [1]
- 78) C [1]
- 79) E [1]

80) B [1]

81) *free response* [Highest total score: 20 pts.].

- a) Award two (2) points for up to five (5) of the following correct conditions (either with exact or sufficiently similar wording). [Highest total score: 10 pts.].
- i) No mutations.
  - ii) Random mating.
  - iii) No natural selection.
  - iv) Extremely large population size.
  - v) No gene flow.
- b) Award up to two (2) points for up to five (5) of the following correct consequences matched to the correct condition absent (either with exact or sufficiently similar wording). One (1)-point-earning responses are superficial generalities or correct consequences matched to the incorrect condition absent. [Highest total score: 10 pts.].
- i) No mutations. ⇒ Consequence: The gene pool is modified if mutations occur or if entire genes are deleted or duplicated.
  - ii) Random mating. ⇒ Consequence: If individuals mate within a subset of the population, random mixing of gametes does not occur and genotype frequencies change.
  - iii) No natural selection. ⇒ Consequence: Allele frequencies change when individuals with different genotypes show consistent differences in their survival or reproductive success.
  - iv) Extremely large population size. ⇒ Consequence: In small populations, allele frequencies fluctuate by chance over time (AKA genetic drift).
  - v) No gene flow. ⇒ Consequence: By moving alleles into or out of populations, gene flow can alter allele frequencies.

NB: This question will also be used as a tiebreaker if necessary. Thus, if the same score is achieved on the whole of the test, the test with the higher score on this free-response section will receive the higher ranking.