

8. (2 marks total) Why do most polyploid species tend to have even numbers? (2 p.) Why are triploid species almost always sterile? (2) How would you account for the appearance of individuals with an odd number of chromosomes (that is, 2n + 2n, 2n + 2n + 2n, etc.) in a series of polyploid species with 2n = 24, 48, 96, 192?

(1) (2 marks total) Polyploids with an even number of chromosomes are more likely to have a regular mitotic division with an odd number, and so are more likely to be fertile. Chromosome number is an odd number - mitosis will produce mostly unbalanced gametes (e.g., 3 sets of chromosomes most segregate into 2 daughter cells, most likely one daughter will end up with 2 sets the other will have only one chromosome from any set of homologs. (2 marks) This is because each of the chromosomes will have a homologous with which to pair and align at the metaphase plate during meiosis 1. Many combinations of unequal number of chromosomes will occur. (2 marks)

(2) (2 marks) These species represent the occasional aneuploid. For instance, the one with 24 chromosomes would have one extra chromosome, and the one with 96 chromosomes would have one chromosome missing from the normal 96.

9. (2 marks total) The following chromosomes are related to each other by a series of inversions and are listed in the order in which they arose. The rank of these changes, relative to the preceding chromosome (the one above) the inversions that would give rise to each inversion:

(1) 1 2 3 4 5 6 7 8 9 10 11

(2) 1 2 3 7 8 9 10 4 5 6 11

(3) 1 2 3 4 5 6 10 8 7 9 11

(4) 1 2 3 4 5 6 10 7 8 9 11

These inversions are overlapping:

(5) 1 2 3 4 5 6 7 8 9 10 11

(6) 1 2 3 4 5 6 7 8 9 10 11

(7) 1 2 3 4 5 6 7 8 9 10 11

(8) 1 2 3 4 5 6 7 8 9 10 11

10. (2 marks total) Diagrams of human chromosomes illustrating inversions and translocations