**Review Worksheet Answers: Meiosis and Sources of Genetic Variation**

1: List the five genetic sources of variation.

(5 marks)

*Mutation*

*Crossing over and recombination during meiosis*

*Random Assortment of Chromosomes during Meiosis*

*Random Fertilisation*

*Non-disjunction during meiosis*

2: Explain what occurs during Meiosis I

(3 marks)

*Homologous pairs engage in Crossing over (0.5) – exchanging some alleles (DNA) (0.5)*

*Homologous pairs separate (0.5) – one of each pair moves to opposite poles (0.5)*

*Ends with a haploid karyotype of single chromosomes (1)*

3: Explain what occurs during Meiosis II

(3 marks)

*Chromosomes line up on spindle (1)*

*Chromosomes pulled apart into individual chromatids during anaphase II (1)*

*Results in 4 cells, each with a unique haploid karyotype of unduplicated chromatids (1)*

4: What is “crossing over” and how does it contribute to genetic variation?

(2 marks)

*Crossing over occurs during Meiosis I. It is where Homologous pairs exchange some alleles (1) and results in far more possible gamete combinations (1)*

5: Discuss what is meant by random assortment of chromosomes during meiosis and how this contributes to genetic variation.

(2 marks)

*Each karyotype contains 23 pairs of chromosomes (0.5). During Meiosis I, one of each pair moves to opposite poles (0.5). Which of each pair goes to each pole is random (0.5). This means there are 223 different ways the pairs can sort to the poles during Meiosis I (0.5), increasing possible gamete combinations and therefore genetic variation.*

6: What is non-disjunction during meiosis and what are some results of this form of variation?

(5 marks)

*Non disjunction is the where one or more chromosome pairs does not separate correctly (1). It can occur during Meiosis I or Meiosis II (1) and results in a karyotype with an abnormal number of chromosomes after fertilisation (1). It generally results in birth defects or miscarriage (1) and is therefore not generally an advantageous form of variation (1).*

7: What is “random fertilisation” and how does it contribute to variation?

(3 marks)

*Random fertilisation refers to the fact that an egg produced can be fertilised by any one of many different sperm (1). This means more potential gamete combinations (1), and therefore greater possible variety in offspring (1).*



8: Draw an annotated homeostatic feedback loop (steady state control diagram) for regulation of blood gas concentration when CO2 levels fall.

(15 marks)

