Higher Tier — Separate Science

Full Higher Separate content. ★ = Higher Tier. ◆ = Separate Science only.

Q1. Describe the products of meiosis and compare them with the products of mitosis.

[3 marks]

Q2. Explain why meiosis is essential for sexual reproduction in humans.

[3 marks]

★ HIGHER TIER

Q3. ★ Explain how crossing over during meiosis contributes to genetic variation.

[3 marks]

Total: 9 marks

EME: Meiosis

Q1 (3 marks)

Describe the products of meiosis and compare them with the products of mitosis.

- Meiosis: 4 daughter cells, haploid (23 chromosomes in humans), genetically different from each other [1]
- Mitosis: 2 daughter cells, diploid (46 chromosomes), genetically identical to parent and each other [1]
- Meiosis is for gamete production; mitosis is for growth and repair [1]

Q2 (3 marks)

Explain why meiosis is essential for sexual reproduction in humans.

- Produces haploid gametes (sperm: 23 chromosomes; egg: 23 chromosomes) [1]
- Fertilisation: two haploid gametes fuse → diploid zygote (46 chromosomes) [1]
- If mitosis produced gametes, fertilisation would double chromosome number every generation [1]

Q3 (3 marks) [★ HT]

★ *Explain how crossing over during meiosis contributes to genetic variation.*

- During prophase I of meiosis, homologous chromosomes pair up [1]
- Segments of chromatids are exchanged between homologous chromosomes (crossing over) [1]
- New combinations of alleles are created on each chromosome — gametes are genetically unique [1]