This is the **Higher Combined Science** version. Higher Tier questions (★) are included. Some Separate-only content has been omitted.

Meiosis and DNA (3.1–3.3)

Specification reference: 3.1

Q1. Explain why meiosis is important for sexual reproduction and genetic variation.

[4 marks]

★ HIGHER TIER

Q2. ★ Describe the two stages of protein synthesis, stating where each occurs.

[4 marks]

Genetic Crosses (3.4–3.6)

Specification reference: 3.4

Q3. Huntington's disease is caused by a dominant allele (H). A person with Huntington's disease (Hh) has children with an unaffected partner (hh). Use a Punnett square to calculate the probability of an affected child.

[4 marks]

★ HIGHER TIER

Q4. ★ Explain what co-dominance is and give ONE example.

[3 marks]

Q5. Explain the difference between continuous and discontinuous variation. Give an example of each.

[3 marks]

Total: 18 marks

Meiosis and DNA (3.1–3.3)

Q1 (4 marks)

Explain why meiosis is important for sexual reproduction and genetic variation.

- Produces haploid gametes (23 chromosomes in humans) [1]
- Fertilisation restores diploid number (46) — essential for species to maintain chromosome number [1]
- Crossing over creates new combinations of alleles on chromosomes [1]
- Independent assortment: random distribution of chromosomes → genetically unique gametes [1]

Q2 (4 marks) [★ HT]

★ *Describe the two stages of protein synthesis, stating where each occurs.*

- Transcription in nucleus: template DNA strand copied into mRNA using complementary base pairing (U replaces T) [1]
- mRNA leaves nucleus through nuclear pores [1]
- Translation at ribosome: ribosome reads codons (triplets of 3 bases) on mRNA [1]
- tRNA brings specific amino acids; peptide bonds form → protein chain [1]

Genetic Crosses (3.4–3.6)

Q3 (4 marks)

Huntington's disease is caused by a dominant allele (H). A person with Huntingto…

- Gametes of Hh: H and h. Gametes of hh: h and h [1]
- Punnett square: Hh, Hh, hh, hh [1]
- 50% probability of Huntington's disease (Hh) [1]
- 50% probability of unaffected (hh) [1]

Q4 (3 marks) [★ HT]

★ *Explain what co-dominance is and give ONE example.*

- Co-dominance: both alleles are expressed equally in the phenotype of a heterozygote [1]
- Example: ABO blood group — I■ and I■ alleles are co-dominant; I■ I■ genotype produces blood group AB (both A and B antigens on red blood cells) [1]
- Neither allele dominates the other — both are visible in the phenotype [1]

Q5 (3 marks)

Explain the difference between continuous and discontinuous variation. Give an e…

- Continuous: a range of values with no distinct categories — controlled by many genes and environment (e.g. height, mass) [1]
- Discontinuous: distinct categories with no intermediates — usually one gene (e.g. ABO blood group) [1]
- Continuous shows a normal distribution; discontinuous shows separate groups [1]