

Higher Combined version — Higher Tier (★) included; Separate-only (◆) removed.

Q1. Explain the inheritance of cystic fibrosis. Include the terms recessive, carrier and allele.

[3 marks]

Q2. Two carrier parents (Ff × Ff) are expecting a child. Use a Punnett square to calculate the probability the child (a) has cystic fibrosis, (b) is a carrier.

[3 marks]

Q3. Polydactyly is caused by a dominant allele (D). Explain why polydactyly is more likely to appear in every generation of a family than cystic fibrosis.

[3 marks]

★ HIGHER TIER

Q4. ★ Explain what is meant by embryo screening and describe ONE ethical argument for and ONE against its use.

[2 marks]

Total: 11 marks

Q1 (3 marks)

Explain the inheritance of cystic fibrosis. Include the terms recessive, carrier and allele...

- Cystic fibrosis caused by a **RECESSIVE** allele (f) [1]
- Two copies of the allele needed to have the condition (ff genotype) [1]
- Carriers (Ff): heterozygous — carry allele but are unaffected [1]

Q2 (3 marks)

Two carrier parents (Ff × Ff) are expecting a child. Use a Punnett square to calculate the...

- Punnett square: FF, Ff, Ff, ff [1]
- (a) ff: 1 in 4 / 25% probability of cystic fibrosis [1]
- (b) Ff: 2 in 4 / 50% probability of being a carrier [1]

Q3 (3 marks)

Polydactyly is caused by a dominant allele (D). Explain why polydactyly is more likely to ...

- Polydactyly: dominant — only **ONE** copy of D needed to show the condition [1]
- An affected person (Dd or DD) will always pass D to approximately 50% of children [1]
- Cystic fibrosis: recessive — **BOTH** parents must carry f and there is only 25% chance per child if both are carriers [1]

Q4 (2 marks) [★ HT]

★ *Explain what is meant by embryo screening and describe ONE ethical argument for and ONE ...*

- Embryo screening: testing embryos produced by IVF for specific genetic disorders before implantation [1]
- For: prevents a child being born with a serious/painful genetic condition; reduces suffering [1] / Against: raises concerns about selecting embryos — "designer babies"; unused embryos are destroyed [1]