Monohybrid inheritance and pedigrees

Student activity • observation and reasoning

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The question

How can a one-gene model predict probabilities without guaranteeing individual outcomes?

Use the supplied examples, record your reasoning and correct it using evidence.

Equipment

- Student booklet, pencil and ruler
- Cross-diagram paper and fictional recessive pedigree

Paper, modelling and written reasoning only. No chemicals or biological samples are handled.

Course coverage: Shared Biology / Double Award: 3.19–3.20 and 3.23–3.25. Alleles, genetic crosses and pedigrees.

Plan, model or apparatus sketch

Draw and label the apparatus or biological model; identify one limitation.

Method and reasoning

Read the whole sequence before starting

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1. Define allele, genotype, phenotype, homozygous, heterozygous, dominant and recessive using a fictional plant trait.

2. Let A give purple flowers and a give white flowers in a complete-dominance model; list gametes from AA, Aa and aa.

3. Construct an Aa × Aa genetic diagram, showing parental genotypes, gametes and offspring genotypes.

4. Calculate genotype and phenotype probabilities and explain why dominant does not mean common, stronger or better.

5. Analyse a fictional pedigree where two unaffected parents have an affected child under an autosomal recessive model; identify the assumptions needed.

6. Predict a second cross Aa × aa and distinguish expected proportions across many offspring from guaranteed family counts.

Cleanup

- Return models and keep the corrected work.

Record your evidence

Blank spaces are for your own work

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Reference and task data

Fictional single-gene model with complete dominance: Aa × Aa gives AA:Aa:aa probabilities 1/4:1/2:1/4 and purple:white 3/4:1/4. Real traits may be more complex. Use fictional pedigrees, not classmates' family histories. This lesson is shared with Double Award.

Example / trial	Observation / evidence	Explanation / limit
Evidence / comparison		
Explanation		
Limit / correction		

Show your calculations, labelled model or correction here.

Explain and evaluate

Use evidence and show calculation steps where relevant

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1. What is an allele?

2. What does heterozygous mean?

3. What is the aa probability from Aa × Aa?

4. Does dominant mean more common?

5. What is the white probability from Aa × aa?

6. Under the stated recessive pedigree model, what are the unaffected parents' genotypes?