3.3 Inheritance

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Course	DP IB Biology
Section	3. Genetics
Topic	3.3 Inheritance
Difficulty	Medium

To be used by all students preparing for DP IB Biology SL
Students of other boards may also find this useful

1

The correct answer is **D** because:

- The investigations that Gregor Mendel carried out demonstrated that there was a unit of inheritance which was inherited from parent plants in 2 different forms; this is a **principle of inheritance** as described in statement I.
- This meant that 2 purebred (homozygous) individuals with different characteristics would produce heterozygous offspring that all display the dominant phenotype, as described in statement II.

Whilst mutations can result in unexpected ratios of offspring, the experiments carried out by Gregor Mendel were based on observation and therefore were much too primitive to confirm this idea.

2

The correct answer is **A** because carrying out many repeats allows anomalies to be identified and removed from the data set before averages are calculated. It also allowed Mendel to demonstrate that the same patterns of data would be achieved each time he repeated the investigation.

Mendel was a pioneer in collecting large amounts of **quantitative** data (rather than qualitative) in his investigations of pea plants. It was the number of data repeats, rather than the time period that he worked over, that ensured the reliability of his results. Whilst carrying out a statistical test may demonstrate the significance of a result, it does not do anything to change the reliability of the original data.

3

The correct answer is **C**. The chromosome number is halved during meiosis, leading to haploid daughter cells, while crossing over and random orientation lead to genetic differences in the 4 gametes produced.

A, B and **D** are incorrect because they either state that the daughter cells are diploid, that they are genetically identical, or both.

4

The correct answer is **D** as it shows a ratio of 3.02:1

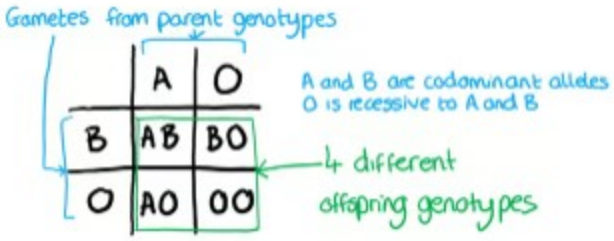
Option **C** is also a very close ratio with 3.2:1 but it is not the closest to the expected outcome of 3:1

A and **B** are a long way off the expected outcome with **B** having the ratios the opposite way round to what is expected

5

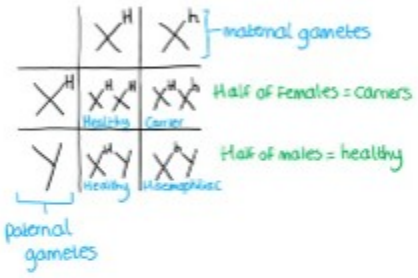
The correct answer is **B**.

Options **A, C and D** are incorrect as they wouldn't give the correct phenotypes in the correct ratios.



6

The correct answer is **D**.



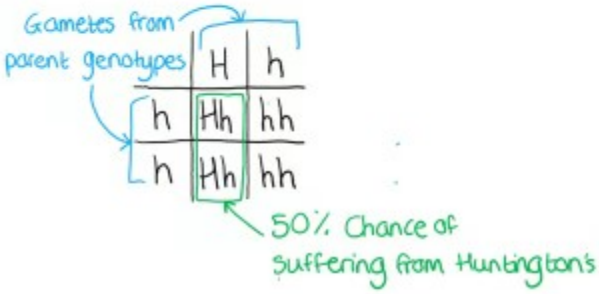
7

The correct answer is **C** because cystic fibrosis is a disease caused by a recessive allele, therefore any sufferer must be homozygous recessive. The sufferer must have inherited one faulty recessive allele from each parent, so the two healthy parents are heterozygous.

Based on the explanation above, all other answers contain one implausible genotype. Though it is not possible to determine whether a healthy individual is homozygous dominant or heterozygous if they have no offspring, in this case both individuals 2 and 3 have children with cystic fibrosis, so we know that they are heterozygous.

8

The correct answer is **A**; Huntington's disease is caused by a dominant allele so parent genotypes must be Hh (heterozygous) and hh.



9

The correct answer is **C** because person Y is a healthy female who would have inherited one healthy allele from her mother and one faulty haemophilia allele from her father. As haemophilia is located on the X chromosome, her father only has one copy to give, and as he is a sufferer, we know that this copy will be the faulty allele.

A and **B** are not plausible genotypes; **A** would be a sufferer rather than healthy, and **B** could not occur as individual Y's father could not pass on a healthy version of the gene.

D is a male genotype, and the key tells us that individual Y is a female.

10

The correct answer is **C**, all three can cause changes to the base sequence of the DNA, X-rays and gamma rays are ionising forms of radiation and benzo(a)pyrene is a chemical mutagen.

Radiowaves and microwaves both have no known mutagenic effects so **A**, **B** and **D** are all incorrect.