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Level: SL IB in Biology
Subject: Biology
Topic: IB SL Biology
Type: Topic Question


All International Baccalaureate IB Topic Questions SL Biology

# BIOLOGY

# SL - IB

## Key skills

## Mark Scheme

Answer 1

The correct answer is C, humans have 46 chromosomes arranged in pairs where the 23rd pair consist of the XY or XX chromosomes. Females have a larger quantity of DNA due to the presence of 2 'X' chromosomes rather than just one 'X' (and one 'Y') present in a male genome. This difference gives a small percentage more DNA in females compared to males (about 1.5%)

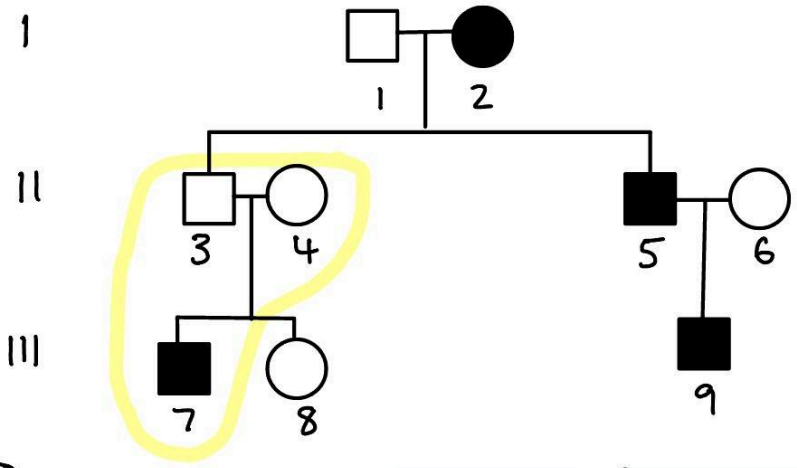
The other options are incorrect as sex is determined by the inheritance of either an 'X' or a 'Y' chromosome which must come from the paternal gametes.

A karyotype is an image which can be taken of the chromosomes although it must be taken during a phase where the chromosomes are visible, this does not include interphase. This is usually in metaphase or the very end of prophase.

Answer 2

The correct answer is A, as Tay-Sachs is an autosomal recessive trait, both parents must be heterozygous for the trait because neither of them has the recessive disorder but some of their offspring do. The probability of the (heterozygous) parents having a child with Tay-Sachs disease will be 25% as shown in the model answer below.

B, C and D are incorrect because the probability is higher than 25%.




① Determine the genotype of the parents.

Tay-Sachs is a recessive disorder, meaning you must be homozygous recessive to suffer from it. So you must inherit a defective allele from each parent.

Individual 7 = homozygous recessive

Individual 3 = heterozygous & Individual 4 = heterozygous

They don't suffer from the disease but have passed on a defective allele to individual 7

Genotype of 3 & 4 = Tt

② Construct a Punnett grid

Normal = $^1/_4$ = 25 %

Carrier = $^2/_4$ = 50 %

Affected = $^1/_4$ = 25 %

| ♀ \ ♂ | T | t |
|---|---|---|
| T | TT | Tt |
| t | Tt | tt |

Answer 3

The correct answer is C because statements I and II are correct. In the AB blood type, both allele $I^A$ and allele $I^B$ are expressed equally resulting in the production of both A and B antigens on the surface of red blood cells. As they exhibit co-dominance neither allele can 'mask' the phenotype of the other.

Statements III and IV simply describe the features of the ABO blood system but they don't describe co-dominance.

Answer 4

The correct answer is C.

A and B are both incorrect because only females can be carriers of the defective gene for clotting factor VIII as haemophilia is an X-linked disorder. If males possessed the faulty gene they would have haemophilia as they only have one copy of the gene.

D is incorrect because the child must have been male as both parents had normal factor VIII. For a female child to have haemophilia the father would have had to suffer from haemophilia and the mother would either be a carrier or sufferer.