

Model Answers: Medium

Q1

The correct answer is **D** because

- The cell shown is a sperm cell, a type of **gamete**. Sperm cells are produced by **meiosis**.
- **Meiosis** is the type of cell division that creates genetically different cells with a **haploid** number of chromosomes, so that during sexual reproduction two gametes form a cell which becomes a new individual, with a **diploid** number of chromosomes in the nucleus of that cell.

A is incorrect as	this is a white blood cell (and therefore a body cell) it would have a diploid number of chromosomes
B is incorrect as	this looks like a plant cell with chloroplasts in it, therefore it would not be a gamete.
C is incorrect as	this is a nerve cell/neurone (and therefore a body cell) which would have a diploid number of chromosomes .

Q2

The correct answer is **D** because:

- If both parents have the condition then they will both have the same **genotype**: **homozygous recessive**.
- Both parents only have (two) copies of the recessive allele; therefore the gametes formed by **meiosis** in each parent will always contain a recessive allele, therefore the only possible genotype for any offspring from these parents will be homozygous recessive.

Note - in genetics it is key to know your definitions!

- **Gene** - section of the chromosome that codes for a particular characteristic.
- **Allele** - alternative version of a gene.
- **Genotype** - the genetic make-up of an organism in terms of the alleles present.
- **Phenotype** - the observable features (physical characteristics) of an organism.
- **Homozygous** - having two identical alleles for the same gene.
- **Heterozygous** - have two different alleles for a particular gene.

Q3

The correct answer is **A** because:

- The production of **gametes** involves meiosis.
- Meiosis results in the production of cells with a **haploid number** of chromosomes and with genetic variation (the daughter cells contain a unique combination of alleles compared to the parent cell) .
- **Mitosis** produces genetically identical cells with a **diploid number** of chromosomes. This is used for **somatic** (body cell) division in growth and repair; so once the **gametes** have fused to form a **zygote** mitotic cell divisions allow the zygote to form an embryo and then a fetus.

All the other answers are incorrect as they have not identified the correct stage for mitosis and meiosis.

Q4

The correct answer is **B** because **meiosis** is the type of cell division that creates genetically different cells with a **haploid** number of chromosomes, so that during sexual reproduction a new organism with a **diploid** number of chromosomes can be made.

A is incorrect as	this is the definition of diploid . This refers to the somatic (body) cells in an organism (everything but the gametes).
C is incorrect as	this is a condition known as Turner's syndrome, where an individual only has one X chromosome.
D is incorrect as	this is a condition known as Klinefelter syndrome, caused by the inheritance of an extra X chromosome in an XY (male) individual.

Q5

The correct answer is **B** because the question states that two daughter cells are produced, which means the division must be mitotic and in having the same chromosome number they will be genetically identical (as the daughter cells are genetic copies of the parent cell).

A is incorrect as	this answer describes the process of meiosis . Meiosis produces gametes for sexual reproduction; gametes are genetically different from the parent cell with only a haploid (half the amount) number of chromosomes of a normal body cell.
C is incorrect as	meiosis does not produce genetically identical cells.
D is incorrect as	mitosis doesn't produce genetically different cells.

Q6

The correct answer is **B** because:

- The gametes produced by the homozygous dominant individual will all contain the allele 'T'
- The possible gametes for the heterozygous parent will contain either 'T' or 't'.

	T	T
T	TT	TT
t	Tt	Tt