Assessment Schedule – 2021

Science: Demonstrate understanding of biological ideas relating to genetic variation (90948)

Evidence Statement

Q	Evidence	Achievement	Merit	Excellence
ONE (a)	<table><tr><td></td><td colspan="3"></td></tr><tr><td></td><td></td><td>X</td><td>Y</td></tr><tr><td></td><td>X</td><td>XX</td><td>XY</td></tr><tr><td></td><td>X</td><td>XX</td><td>XY</td></tr></table>	• Any correct line in Punnett square.		
(b)	Women are XX, so when they create eggs with half the number of chromosomes, both eggs will have an X chromosome. A male is XY so when they create sperm, half will have the X chromosome and half will have the Y chromosome. When the gametes fuse (egg is fertilised), there is a 50% probability they will have a baby girl.	• Boys are XY and Girls are XX.	• Explains that it is the sperm / male that gives the sex of the baby due to **sperms carrying X or Y and eggs only X**.	• Discusses that it is the sperm / male that gives the sex of the baby due to sperms carrying X or Y and eggs only X.
(c)	The sex of the baby is determined by whether it is an X or a Y (sperm) that fertilises the egg. If it is X, it will be female; if it is Y, it will be male. The fact that they already have two girls and one boy has no effect on what the next baby will be. Fertilisation is random at each event, and previous fertilisations have no effect.	• 50% girl / boy. • States previous offspring have no effect.	• Explains previous children have no effect, as each new fertilisation is a new and **separate event** (not affected by prior) **and outcome remains 50% / 1:1 / 2:2 / half.**	AND Explains previous children have no effect, as each new fertilisation is a new and **separate event** (not affected by prior) **and outcome remains 50%.**
(d)	The lung disease was due to stone dust. Silicosis was caused by 'environment', not genetics. Only genetic characteristics can be inherited, not those acquired as a result of environment. No children will be born with lung disease, as this lung disease was caused by an environment of stone dust, not genetics.	• States this type of lung disease is caused by environment / stone dust, **not genetics**. • States this cannot be passed onto offspring. • States only genetic traits / information in gametes can be passed on.	• Explains no children will be born with lung disease because it was **environmental / not caused by genetics**, and thus impossible to pass down in gametes / reproductive cells produced. • The lung disease could **affect** only John's **lung / body** cells exposed to stone dust, and **not his gametes**.	• Discusses that no children will be born with lung disease because it is **environmental / not caused by genetics** and can't be **passed down**. AND Lung disease affects the **lung / body cells and not the gametes.**

NØ	N1	N2	A3	A4	M5	M6	E7	E8
No response, or no relevant evidence.	ONE Achievement point.	TWO Achievement points.	THREE Achievement points.	FOUR Achievement points.	TWO Merit points.	THREE Merit points.	TWO Excellence points; minor omission.	TWO Excellence points.

Q	Evidence	Achievement	Merit	Excellence
TWO (a)	DNA – contains the genetic instructions. Gene – a section of DNA that codes for a particular protein / feature / characteristic. A gene is a segment of DNA, and the base sequence provides the code. A mutation is a change in the order of DNA bases, which causes a new version of the gene called an allele. The new allele codes for the phenotype "protection from HIV virus".	• Defines DNA as a length genetic information / bases / nucleotides. • Defines gene as a section of DNA OR DNA codes for a trait / protein / phenotype. • Defines allele as a. different form of a gene. • Defines phenotype OR describes protection from HIV. • Defines mutation is a change in the DNA.	• Explains that (DNA) **base sequence** on a gene **determines the appearance**of a particular feature. • A mutation is **a change in the DNA base**s, which codes for a **new phenotype / trait.**	• Discussion which links the explanation of the relationship between DNA, genes and alleles with a **mutation** causing a change in the order of bases coding / or a **new allele** for the phenotype **which gives protection from HIV virus.**
(b)	The mutation creates the phenotype "protection from HIV virus", resulting in less risk of disease. A reduction in disease would mean more chance of an individual surviving to adulthood to reproduce passing on this new allele (mutation) to the next generation. During reproduction fertilisation occurs, and gametes fuse passing genetic information, including the new alleles from parents to children. Over many generations, the number of individuals with the advantageous mutation will rise, meaning the population is more resistant to HIV and increased survival.	• State mutation (protection from HIV virus) help**s survival**. • State trait / mutation passed onthrough DNA / genes / gametes.	• Explains mutation (protection from HIV virus), results in **less risk of disease and helps survival.** • Explains a reduction in disease would mean more chance of an individual **survive to adulthood to reproduce**, passing on this new allele (mutation) to the next generation. • Explains during reproduction, gametes fuse **passing genetic information**, including the **new alleles** / **genes** from parents to children. • Explains over many **generations**, the number of individuals with the advantageous mutation (protection from HIV virus) **will rise**.	• The mutation creates the phenotype (protection from HIV virus), resulting in **less risk of disease.** A reduction in disease would mean more chance of **survival to reproduce**, passing on this new **phenotype / trait to the next generation**. • Explains reproduction event as passing on genetic information. AND Over many generations, **the number of individuals** with the advantageous mutation will rise, meaning increased survival of the population.

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Q	Evidence	Achievement	Merit	Excellence
THREE (a)	Process of fertilisation: Random male and female gametes fuse, each with unique DNA, producing a genetically unique zygote / offspring. Process of meiosis: Random assortment of chromosomes / crossing over of chromosomes in meiosis and random fertilisation produce new combination of alleles and increase genetic variation between individuals.	• Defines random fertilisation. • States gametes fuse during fertilisation. • State gametes are genetically unique. • States gametes have half the chromosome number.	• Explains meiosis creates genetic variation by **random assortment** of DNA / **crossing over** / **independent segregation** chromosomes during meiosis. • Explains **fertilisation** and how its **random nature** creates genetic variation. (egg and sperm). • Explains **fertilisation** and how **DNA from two parents** create genetic variation. (1 / 2 from each parent).	• Discusses how meiosis (one way). AND Fertilisation causes genetic variation.
(b)	Himalayan wolves have combinations of genes to take more oxygen from the air. The advantage of genetic variation in Himalayan wolves is that it allows the wolves the ability to live above 4000 m, giving them a greater chance of surviving, and increasing the chance of passing on favourable combinations of genes to the next generation. Over many generations, these combinations of genes have risen in the population allowing survival of the Himalayan wolf population above 4000 m.	• States Himalayan wolf has combinations of genes to survive above 4000 m. • All wolves are genetically different.	• Explains **genetic variation** in Himalayan wolf has allowed the ability **to take in more oxygen** to live above 4000m. • Over many **generations**, these combinations of genes **have risen in the population**.	• Explains **genetic variation** in Himalayan wolf has allowed the ability **to take in more oxygen** to live above 4000 m. Over many **generations**, these combinations of genes have **risen in the population**.

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Cut Scores

Not Achieved	Achievement	Achievement with Merit	Achievement with Excellence
0 – 6	7 – 13	14 – 18	19 – 24