

0 2

The shape of a person's earlobes is controlled by a gene.

**Figure 3** shows two types of earlobe.

**Figure 3**



**Free earlobe**



**Attached earlobe**

A dominant allele codes for free earlobes.

0 2 . 1

What is a dominant allele?

**[1 mark]**

Tick (✓) **one** box.

An allele expressed even if a person only has one copy of the allele

An allele expressed only if a person has two copies of the allele

An allele expressed only if a person has no recessive allele

An allele expressed only if it is inherited from the male parent

**Question 2 continues on the next page**

**Turn over ►**



**0 2 . 2** A man with free earlobes and a woman with attached earlobes have children together.

Complete **Figure 4** to show the possible genotypes of the children.

Use the symbols:

**E** = allele for free earlobes

**e** = allele for attached earlobes

**[2 marks]**

**Figure 4**

		<b>Woman</b>	
		e	e
<b>Man</b>	<b>E</b>	Ee	
	<b>e</b>		

**0 2 . 3** What is the probability that one of the children would have attached earlobes?

Use **Figure 4**.

**[1 mark]**

Tick (✓) **one** box.

0.125

0.25

0.5

0.75



0 2 . 4

**Figure 5** shows the inheritance of the sex chromosomes, **X** and **Y**.

Complete **Figure 5** to show the sex chromosomes in the gametes of the man and the woman.

[2 marks]

**Figure 5**

	<b>Woman</b>	
<b>Man</b>	XX	XX
	XY	XY

0 2 . 5

Calculate the probability that the man and the woman's next child will be a girl with attached earlobes.

[2 marks]

Use the equation:

probability of a girl with attached earlobes

= probability of attached earlobes × probability of being a girl

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Probability of a girl with attached earlobes = \_\_\_\_\_

8

Turn over ►



Question	Answers	Extra information	Mark	AO / Spec. Ref.															
02.1	an allele expressed even if a person only has one copy of the allele		1	AO1 4.6.1.6															
02.2	<table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td></td> <td></td> <td colspan="2" style="text-align: center;">Woman</td> </tr> <tr> <td></td> <td></td> <td style="text-align: center;">e</td> <td style="text-align: center;">e</td> </tr> <tr> <td rowspan="2" style="vertical-align: middle;">Man</td> <td style="text-align: center;">E</td> <td style="text-align: center;">Ee</td> <td style="text-align: center;">Ee</td> </tr> <tr> <td style="text-align: center;">e</td> <td style="text-align: center;">ee</td> <td style="text-align: center;">ee</td> </tr> </table>			Woman				e	e	Man	E	Ee	Ee	e	ee	ee	all 3 correct= 2 marks 1 or 2 correct = 1 mark	2	AO2 4.6.1.6
		Woman																	
		e	e																
Man	E	Ee	Ee																
	e	ee	ee																
02.3	correct probability from Figure 4	if no answer in Question 02.2 allow 0.5	1	AO3 4.6.1.6															
02.4	<table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td></td> <td></td> <td colspan="2" style="text-align: center;">Woman</td> </tr> <tr> <td></td> <td></td> <td style="text-align: center;">X</td> <td style="text-align: center;">X</td> </tr> <tr> <td rowspan="2" style="vertical-align: middle;">Man</td> <td style="text-align: center;">X</td> <td style="text-align: center;">XX</td> <td style="text-align: center;">XX</td> </tr> <tr> <td style="text-align: center;">Y</td> <td style="text-align: center;">XY</td> <td style="text-align: center;">XY</td> </tr> </table>			Woman				X	X	Man	X	XX	XX	Y	XY	XY	gametes = X + X <b>and</b> X + Y allow in incorrect positions  X, X, X and Y in correct boxes	1  1	AO2 4.6.1.6 4.6.1.8
		Woman																	
		X	X																
Man	X	XX	XX																
	Y	XY	XY																
02.5	answer from Question 02.3 × 0.5  answer to calculation in mp1	an answer matching the answer from Question 02.3 × 0.5 scores <b>2</b> marks  if no answer in Question 02.3, an answer of 0.25 / ¼ / 1 in 4 / 25% scores <b>2</b> marks  if no answer in Question 02.3 allow 0.5 × 0.5  if no answer in Question 02.3 allow 0.25 / ¼ / 1 in 4 / 25%	1  1	AO2 4.6.1.6 4.6.1.8															
<b>Total</b>			<b>8</b>																