

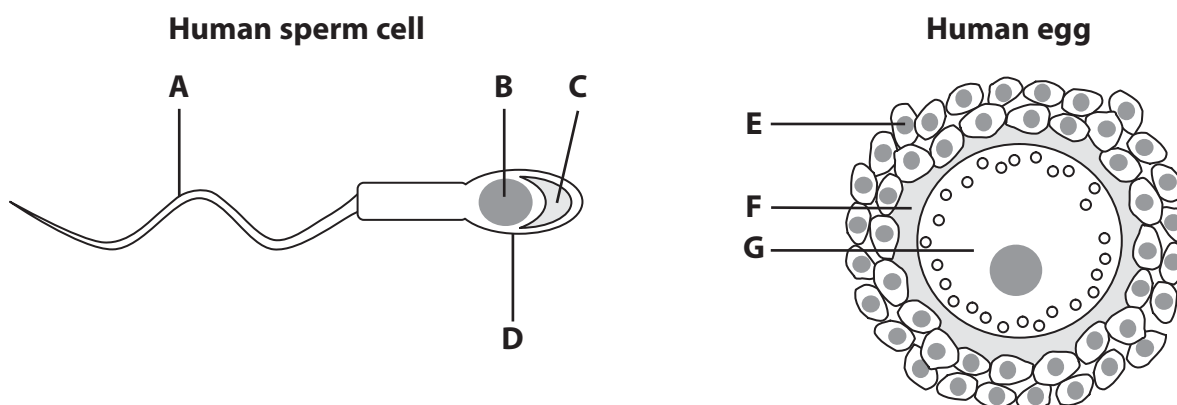
4 Meiosis is involved in the formation of human gametes.

(a) Explain the importance of meiosis in the formation of human sperm and egg cells.

(3)

(b) Sperm cells release acrosin, an enzyme found in the acrosome. This enzyme is involved in digesting the zona pellucida (jelly layer) during fertilisation.

The diagrams below show a human sperm cell and a human egg.



(i) The table below describes four sites.

Place a cross ☒ in the box below the letter that correctly links the statement to one of the labels on the diagrams above.

(4)

Statement	A	B	C	D	E	F	G
Site containing acrosin	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Site where acrosin works	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Site containing the haploid number of chromosomes	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Site containing mitochondria	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>



(ii) Describe how the acrosin is released from the acrosome.

(2)

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- (c) An investigation was carried out to study the effect of acrosin activity on fertilisation success. Sperm cells with different levels of acrosin activity were mixed with human eggs in a glass container. The number of eggs fertilised was then counted and the percentage of eggs fertilised was calculated.

The results are shown in the table below.

Acrosin activity / arbitrary units	Percentage of eggs fertilised (%)
2.5	33
3.0	66
4.0	85
5.0	100

- (i) A student stated that acrosin needs to be active for the eggs to be fertilised and that the higher the acrosin activity, the greater the percentage of eggs fertilised.

Give **one** piece of evidence from the table that supports some of his statement.

(1)

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- (ii) Using the data in the table, suggest why the student could **not** support all of his statement.

(1)

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Total for Question 4 = 11 marks

