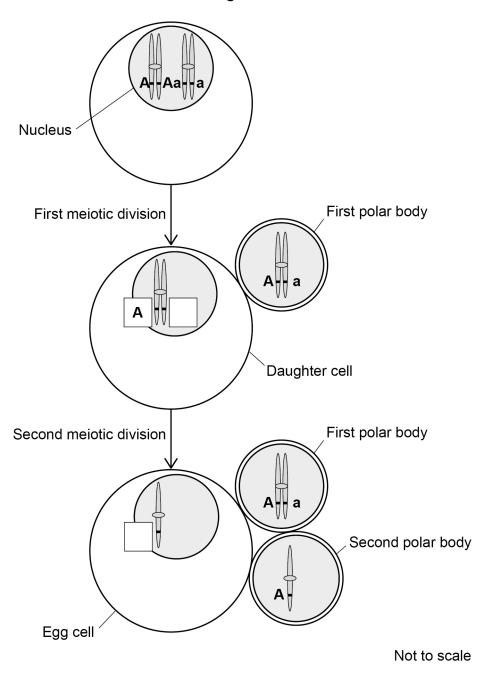
0 3

In women, the first division of meiosis produces one daughter cell that has almost all of the cytoplasm. The other daughter cell consists of a nucleus surrounded by a very small amount of cytoplasm and a cell-surface membrane. This very small daughter cell is called a polar body. Polar bodies do not usually divide. The same process occurs in the second division of meiosis, resulting in one egg cell and two polar bodies.

The diagram in **Figure 3** shows the formation of an egg cell and two polar bodies during meiosis. It also shows what happens to one pair of homologous chromosomes. This pair carries two alleles of gene A.

Figure 3





0 3.1	Complete Figure 3 by putting A or a in the boxes. One box has been completed for you with A .
	[1 mark]
0 3.2	Put a tick (✓) in the box next to the name of the process that produced the combination of alleles on the chromosome in the first polar body in Figure 3 . [1 mark]
	Anaphase
	Crossing over
	Independent assortment
	Semi-conservative replication
0 3.3	A scientist measured the diameter of a polar body and the diameter of the nucleus inside it. The diameter of the polar body was 10.4 μm and the diameter of the nucleus was 7.0 μm . The density of mitochondria in the cytoplasm of the polar body (outside of the nucleus) was 0.08 mitochondria per μm^3 . Calculate the number of mitochondria in the polar body. You should assume polar bodies and nuclei are spherical. The formula for the volume of a sphere is $\frac{4}{3} \pi r^3$ where $\pi = 3.14$
	Show your working. [2 marks]
	Number of mitochondria =

Turn over ▶



0 3.4	condrial diseases are caused by faulty mitochondria. All of a person's condria are inherited from their mother via the egg cell. An egg cell contains kimately 3×10^5 mitochondria.		
	One proposed treatment to prevent passing on faulty mitochondria involves		
	removing the nucleus from an egg cell donated by a woman with healthy		
	 mitochondria replacing this nucleus with the contents of the polar body from a woman whose egg cells are affected by mitochondrial disease. 		
	Suggest how this treatment prevents inheritance of mitochondrial diseases. [2 marks]		



0 3.5	If most of the mitochondria in a cell are faulty, this prevents many important enzyme-catalysed reactions taking place or slows them down.	
	Suggest and explain one reason why.	[2 marks]

Turn over for the next question

Turn over ▶