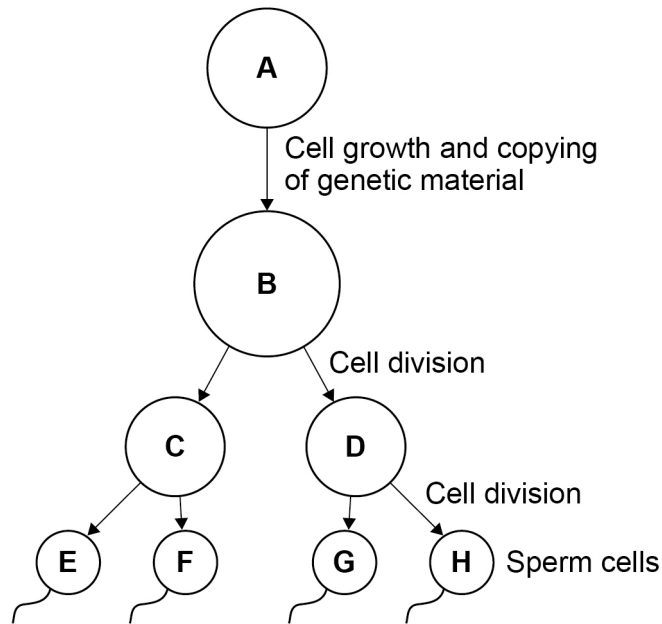**0 3** **Figure 6** shows the production of sperm cells in humans.

Figure 6

0 3 . 1 Cell **A** is a normal body cell.

How many chromosomes are there in cell **A**?

[1 mark]

Tick (✓) **one** box.

23 ☐   46 ☐   48 ☐   92 ☐

0 3 . 2 What is the mass of DNA in cell **E**?

[1 mark]

Tick (✓) **one** box.

A quarter of the mass of the DNA in cell **A** ☐

Half the mass of the DNA in cell **A** ☐

The same mass as the DNA in cell **A** ☐

Twice the mass of the DNA in cell **A** ☐

0 3 . 3 What type of cell division produces sperm cells?

[1 mark]

Tick (✓) **one** box.

Binary fission ☐

Differentiation ☐

Meiosis ☐

0 3 . 4 Sometimes there are errors in copying the genetic material.

What term describes an error in the genetic material?

[1 mark]

Tick (✓) **one** box.

Absorption ☐

Fertilisation ☐

Mitosis ☐

Mutation ☐

0 3 . 5 A woman has three children, aged 4, 6 and 9 years.

Why are the children **not** genetically identical?

[2 marks]

_____

_____

_____

_____

Turn over ▶

In sexual reproduction, a sperm cell fuses with an egg cell to form a new single cell.

An embryo develops from the single cell.

The cell divides three times to produce the embryo.

0 3 . 6 How many cells are there in the embryo after three cell divisions?
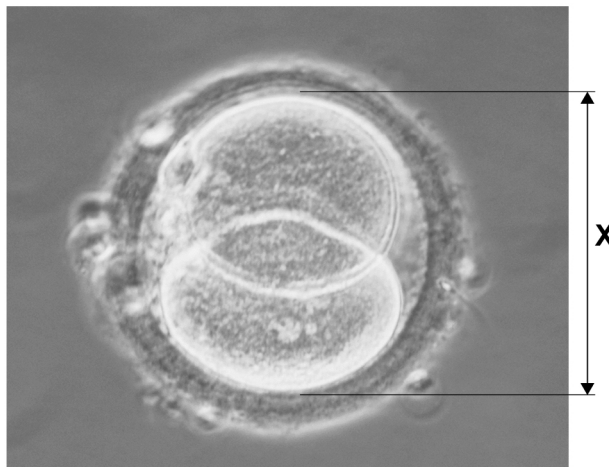
[1 mark]

Tick (✓) **one** box.

3 ☐   6 ☐   8 ☐   9 ☐

Figure 7 shows a different human embryo.

Figure 7

X

0 3 . 7 Measure image length **X** on **Figure 7**.

[1 mark]

Give your answer in millimetres (mm).

X = _____ mm

0 3 . 8 The image in **Figure 7** has been magnified ×500

Calculate the real length of the embryo.

Use the equation:

$$\text{real length of the embryo} = \frac{\text{image length}}{\text{magnification}}$$

Give your answer in micrometres (µm).

1 mm = 1000 µm

[3 marks]

_____

_____

_____

_____

Real length of the embryo = _____ µm

0 3 . 9 The embryo may **not** implant in the lining of the uterus.

The embryo will then be lost from the woman's body several days later.

Explain why the woman may **not** notice this has happened.

[2 marks]

_____

_____

_____

13

Turn over for the next question

Turn over ▶

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.1	46		1	AO1 4.6.1.2 4.6.1.8
03.2	half the mass of the DNA in cell **A**		1	AO2 4.6.1.2
03.3	meiosis		1	AO1 4.6.1.2
03.4	mutation		1	AO1 4.6
03.5	any **two** from: • different egg / sperm each time • genes from two parents • each gamete / egg / sperm has different alleles / genes / DNA / genetic information	ignore different chromosomes ignore the children have different genes / alleles	2	AO2 4.6 4.6.1.1
03.6	8		1	AO2 4.1.2.2 4.6.1.2
03.7	40	allow in range 39 to 41	1	AO2 4.6.1.2
03.8	$\frac{40}{500}$ × 1000 80	an answer of 80 scores **3** marks allow ecf from Question **03.7** for **3** marks an answer of 0.08 scores **2** marks allow $\frac{\text{answer to Question } 03.7}{500}$ an answer from mp1 but not × 1000 scores **2** marks	1 1 1	AO2 4.6.1.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.9	embryo is (very) small		1	AO2 4.5 4.5.3.4
	(so) embryo not seen / felt **or** lost in normal menstrual flow	ignore not noticed	1	AO3
Total			**13**	