

Solutions

2.1 Cell wall; plasmid / single DNA loop not in a nucleus.

2.2 Tail (flagellum) for swimming to the egg; many mitochondria release energy for movement.

2.3 Convert: $2.4 \text{ mm} = 2400 \text{ } \mu\text{m}$ (C1).

$$\text{real size} = \frac{2400}{800} = \mathbf{3.0} \text{ } \mu\text{m}$$

(division C1, answer with unit A1.)

3.1 Mitochondria carry out aerobic respiration releasing energy (ATP) for contraction; ribosomes synthesise proteins – the contractile protein fibres the cell needs.

3.2 (a) The flame kills any microorganisms already on the loop, so only the intended bacterium is transferred – no contamination. (b) $25 \text{ }^{\circ}\text{C}$ limits growth to non-pathogenic bacteria; $37 \text{ }^{\circ}\text{C}$ body temperature could grow pathogens harmful to humans. (c) $r = 6 \text{ mm}$ (C1): $A = \pi \times 6^2 = \mathbf{113} \text{ mm}^2 \approx 110 \text{ mm}^2$.

3.3 (a) $2 \text{ hours} = 120 \text{ min} = 6 \text{ divisions}$ (C1): $2^6 = \mathbf{64} \text{ cells}$. (b) $\mathbf{6.4} \times 10^1$.