Solutions

Marking: **M1** a correct method, **A1** the correct answer, **B1** an independent mark.

Each answer shows the steps, then the **result**.

2.1

any two: mutation; crossing over / independent assortment in meiosis; random fertilization

2.2

a mutation gave a few bacteria resistance (variation); the antibiotic killed non-resistant bacteria, so resistant ones survived and reproduced; they passed on the resistance allele, so its frequency rose

2.3

females prefer to mate with brightly coloured males: sexual selection; with few predators, bright males are not much more likely to be eaten; so bright males have more offspring and the alleles for bright colour become more common

2.4

$q^2 = 0.09$, so $q = 0.3$; $p = 1 - 0.3 = 0.7$; $2pq = 2 \times 0.7 \times 0.3 = 0.42$, so **42**%

2.5

directional selection favours one extreme of the range; so the mean shifts in that direction; stabilizing selection favours the middle and removes both extremes, so the mean stays the same and the range narrows

3.1

(a) 95% (accept 93–97%)

(b) soot darkened tree bark, so light moths were seen and eaten by birds more often; dark moths survived and reproduced more; the allele for dark colour was passed on and became more frequent

(c) clean-air laws reduced soot, so bark became lighter again; dark moths were now seen and eaten more, so the light form was selected

3.2

(a) in natural selection the environment decides which individuals survive and reproduce; in artificial selection humans choose which individuals breed, for traits useful to them

(b) choose the plants with the largest seeds; breed them together / collect and sow only their seeds; repeat over many generations

(c) e.g. less genetic variation, so the crop is more likely to be wiped out by a new disease

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