Solutions

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

2.1

- It has no natural predators in the new area, so its population is not kept in check

2.2

- Any one: habitat destruction, pollution, climate change, overharvesting

2.3

- A species with an outsized role whose loss greatly affects the whole community

2.4

- mutations are random and not caused by the antibiotic; resistant mutants that already exist survive and are selected

2.5

- the heterozygous genotype has a higher relative fitness than either homozygous genotype

3.1 B

- lacks natural predators in the new area

3.2

(a)

- The native prey population declines (may collapse)

(b)

- Species that ate the prey lose their food, and species the prey controlled may increase – the change ripples through the food web

3.3

- A keystone species has a large effect on many others (e.g. controlling prey numbers); removing it lets some populations explode and others crash, disrupting the whole community

3.4

(a)

- $Hb^{A}Hb^{S}$

(b)

- heterozygotes are protected against malaria, so they survive better than $Hb^{A}Hb^{A}$
- each heterozygote that survives and reproduces passes on Hb^{S}, so selection keeps the allele in the population

(c)

- the frequency of Hb^{S} would fall
- without malaria heterozygotes lose their advantage, while $Hb^{S}Hb^{S}$ individuals still have low survival, so selection now acts against the allele

3.5

(a)

- adaptations suit a particular environment; when it changes faster than populations can adapt (for example, no light so photosynthesis and food chains collapse)
- few individuals have traits that let them survive, so populations fall to zero

(b)

- the extinctions left many niches empty, with fewer competitors and predators
- surviving mammals diversified to fill them: adaptive radiation

3.6 A

- with no genetic variation, no plants are likely to be resistant, so one pathogen can spread through the whole crop