

Solutions

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

2.1

- a tree is planted for every tree that is felled, so the forest **replaces** what is taken
- the rate at which wood is **produced** then equals the rate at which it is **removed**, so the resource does not run out

2.2

- any **three** of: **climate change**; **habitat destruction**; **hunting**; **overharvesting**; **pollution**; an **introduced species**

2.3

- any **two** of: **replanting** a tree for each one felled; setting up **protected areas** where felling is banned; setting **quotas** on how much timber may be taken; **education**, so that people accept and support the rules

2.4

- any **three** of: **quotas** on the mass of fish landed; a **closed season** during breeding; **protected areas** where no fishing is allowed; a **larger mesh size**, or controlled net types; **monitoring** the stock; **education**

2.5

- a seed bank stores **seeds** of many different varieties in cool, dry conditions
- so that a plant species can be grown again even if it is lost from the wild, which also preserves its **genetic variation**

2.6

- a small population contains only a **small number of alleles**, because most were lost with the individuals that carried them
- so there is little **genetic variation** in the population
- the species is then unlikely to contain an individual that survives a **new disease** or a change in the environment, so one event could kill them all

3.1 C

- a larger mesh lets the **young, smaller fish pass through** the net, so they survive to breed
- **A**, **B** and **D** all conserve the stock, but none of them works by letting young fish escape from a net

3.2

(a)

- the species is **bred in captivity**, in zoos or reserves, where it is protected from hunting and from predators

- individuals are later **released into the wild** to rebuild the wild population

(b)

- **artificial insemination** places sperm from a chosen male into a female without the animals meeting, so animals in **different zoos** can be bred together
- **in vitro fertilisation** fertilises the egg **outside the body** and the embryo is placed into a female; both let the programme choose which individuals breed, keeping as much genetic variation as possible

(c)

- with only 60 individuals there is very little **genetic variation**, and close relatives must often be bred together
- so the offspring are all similar, and the species remains vulnerable to a single disease or change in conditions

3.3

(a)

- the fish were caught **faster than they could reproduce** and be replaced
- so fewer adults were left to breed each year, and the population fell further, giving a smaller catch

(b)

- a quota **limits the mass of fish** that may be landed
- so removal no longer exceeds replacement, and enough adults are left to breed and rebuild the population

(c)

- a larger mesh lets the **young fish escape** through the net
- so they survive to reach breeding age and reproduce, instead of being caught first

(d)

- no fishing is allowed during the **breeding season**
- so the adults can reproduce undisturbed and their young survive, which increases the number of fish in the next generation

(e)

- any **two** of: maintaining or increasing **biodiversity**; reducing the risk of **extinction**; protecting a **vulnerable ecosystem**; maintaining **ecosystem functions** such as nutrient cycling; keeping a source of food, drugs or **genes** for the future

(f)

- so that the government can see whether the stock is recovering, and **change the quotas** if it is not