

Solutions

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

2.1

- a pathogen is an organism that **causes disease**

2.2

- any **two** of: skin / nose hairs / mucus / stomach acid / white blood cells

2.3

- any **two** of: skin as a barrier / nose hairs / mucus trapping pathogens / cilia sweeping mucus away

2.4

- an antibody has a shape **complementary to one antigen**
- measles and influenza have **different antigens**, so the measles antibody cannot bind

2.5

- any **two** of: chlorinate water / treat sewage / boil water / hand washing

3.1 B

- an antibody's shape is **complementary to the pathogen's antigen**
- A, C and D are not how binding works

3.2

(a)

- vaccine antigens make lymphocytes produce **antibodies**
- **memory cells** form
- if the real pathogen arrives, antibodies are made **fast**, so you do not become ill

(b)

- **active**: your own body, long-term, memory cells
- **passive**: another body's antibodies, short-term, no memory cells

3.3

(a)

- vaccine introduces antigens (weakened/dead/partial pathogen)
- lymphocytes recognise them and make **specific antibodies**
- **memory cells** remain, so later antibodies are faster and larger

(b)

- the person's **own lymphocytes** make the antibodies
- memory cells remain, so protection is **long lasting**

(c)

- **passive** immunity
- antibodies were made by the **mother**, not the baby
- no memory cells, so the antibodies are **broken down** and protection fades

(d)

- the phagocyte **engulfs** the pathogen
- **enzymes digest** and destroy it

(e)

- too few people left who can catch and pass it on
- the pathogen cannot spread easily — **herd immunity**