Solutions

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

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

2.1

A: **attachment / entry**

B: **copying the genome** (reverse transcription)

C: **release** of new viruses

2.2

influenza has a lipid envelope, which alcohol dissolves

norovirus has no envelope; its protein capsid resists alcohol

2.3

swab 1, Ct 20

10 cycles: about $2^{10} \approx$ **1000 times** more

2.4

drift: small mutations in HA and NA, so a new vaccine is needed each year

shift: gene segments from two different viruses mix, giving a new subtype that can cause a pandemic

3.1

(a) **varicella-zoster virus**, latent in a sensory (dorsal root) ganglion

(b) the virus travels down the sensory nerve from one ganglion, which supplies one dermatome

(c) T cell immunity gets weaker with age

(d) not shingles, but a child who has not had chickenpox can catch **chickenpox** from the fluid in the blisters

(e) the shingles (zoster) vaccine

3.2

(a) 1: **CD4**; 2: **CCR5** (or CXCR4)

(b) reverse transcriptase makes many errors with no proofreading; with billions of copies a day, resistant mutants appear and are selected by the drug

(c) the virus would need several mutations at once to escape all three

3.3

(a) the viruses have entered cells and lost their coats; new viruses have not yet been assembled

(b) about **6 hours**

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(c) $10^8 \div 10^6 =$ **100** per cell

(d) no: budding takes envelope from the membrane and the cell can live for some time

(e) antibiotics act on bacterial parts such as the wall or bacterial ribosomes; viruses have none of these and use the host cell's machinery