

Solutions

2.1

- Uncoating, then replication of genome and proteins ✓.

2.2

- Drift: point mutations accumulating (no proofreading); shift: reassortment of segmented genomes between strains ✓.

2.3

- $(10^3)^2 = 10^6$ progeny after 12 h ✓.

3.1

- Each round multiplies by $\sim 10^3$: two rounds (12 h) give 10^6 ; 1–2 days of incubation is only 4–8 rounds ✓.
- Fast cycles $\rightarrow$ many infectious people within a day $\rightarrow$ contact tracing is outrun.
- A 2–3-week incubation (DNA virus such as varicella) spreads slowly and peaks later ✓.
- RNA without proofreading ($\sim 10^{-5}$ /site) $\rightarrow$ drift $\rightarrow$ yearly vaccine updates ✓.

3.2

- Replication (the antiviral) and attachment (the vaccine antigen) ✓.
- Antibodies act outside the cell: the attachment glycoprotein is the surface they can reach before entry.
- Enveloped viruses bud – host membrane flows around the virion, cell stays intact ✓.