

# 8.3 Viruses

Name: \_\_\_\_\_ Class: \_\_\_\_\_ Date: \_\_\_\_\_ **Total: 23 marks**

**KEY WORDS** capsid • envelope • antigenic drift

## Objective

Read the viral cycle and its mutation arithmetic.

### 1 Key knowledge and worked examples

■ **The six steps**

Attachment → entry → uncoating → replication → assembly → release ✓. Genome + capsid ± envelope; enveloped viruses bud, naked viruses lyse the cell.

■ **Worked example: drift and shift**

RNA polymerases lack proofreading:  $\sim 10^{-5}$  errors per site per replication,  $\sim 10,000$ -fold above DNA viruses → antigenic drift; 8 segments reassort → antigenic shift ✓. One virion →  $\sim 10^3$  progeny in  $\sim 6$  h.

## 2 Practice

**2.1** List the cycle steps between entry and assembly. [3]

**2.2** Distinguish antigenic drift from antigenic shift. [3]

**2.3** One virion yields  $\sim 10^3$  progeny per  $\sim 6$ -h round – how many after two rounds? [3]

## 3 Exam-style questions

**3.1** A fictional winter outbreak: incubation 1–2 days, attack rates  $\sim 20\%$  in offices; a second fictional community outbreak shows incubation 2–3 weeks.

Use the burst arithmetic ( $\sim 10^3$  per round,  $\sim 6$  h) to explain why the first virus outruns contact tracing while the second spreads slowly and peaks later. State which genome chemistry predicts yearly vaccine updates and why. [7]

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**3.2** A fictional antiviral blocks the step where the viral genome and proteins are copied inside the cell; a fictional vaccine presents the surface glycoprotein that docks the virion to the receptor.

Name the two cycle steps targeted. Explain why the vaccine antigen choice makes immunological sense (antibodies meet the outside of the virion first). Explain why enveloped viruses exit without lysing the cell. [7]

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