

# 7.4 Immunological memory and vaccination

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

**KEY WORDS** herd immunity

## Objective

Read primary/secondary curves and compute herd-immunity thresholds.

## 1 Key knowledge and worked examples

### ■ The curves

Primary: 4–7 d lag, IgM→IgG, peak 7–14 d. Secondary: hours–2 d, IgG, 10–100× ✓. Herd:  $1 - 1/R_0$ .

### ■ Worked example: policy from one equation

Measles  $R_0$  12–18 → 92–95 % immune; influenza 1.3 → ~25 % ✓.

## 2 Practice

**2.1** Which Ig class dominates a secondary response? [3]

**2.2** Compute the herd threshold for  $R_0 = 4$ . [3]

**2.3** Why does a 3-dose schedule exist for hepatitis B? [3]

## 3 Exam-style questions

**3.1** A serology shows day 5 IgM positive/IgG negative and day 16 IgM positive/IgG fourfold rise (fictional).

Interpret both timepoints (acute primary infection, seroconverting). Explain the class and titre pattern from the primary curve. State what a stable single IgG titre would mean. [7]

**3.2** A region’s measles vaccine coverage drops from 95 % to 84 % (fictional).

Compute the susceptible fraction above threshold (needed  $\leq$  ~5–8 %; now 16 %). Explain why outbreaks follow ( $R_0$  12–18). State what coverage the region must restore and why influenza policy differs (~25 % threshold). [7]