

7.2 Antigen recognition: antibodies, receptors and MHC

Name: _____ Class: _____ Date: _____

Total: 24 marks

KEY WORDS major histocompatibility complex

Objective

Distinguish the two recognition systems and compute diversity and match probabilities.

1 Key knowledge and worked examples

■ The chemistries

Ig/BCR binds free antigen (whole shape); TCR sees peptide + MHC only (I: cytosol → CD8; II: eaten → CD4) ✓.

■ Worked example: the library

V(D)J + junctional diversity → 10^6 – 10^8 specificities; class switch

- affinity maturation 10–100×; sibling full match 1/4 ✓.

2 Practice

2.1 Which Ig class crosses the placenta? [3]

2.2 What does MHC-I display and to which T-cell subset? [3]

2.3 Compute the chance two siblings share both HLA haplotypes. [3]

3 Exam-style questions

3.1 A laboratory reports a new antibody titre $40\times$ baseline at day 14 (fictional serology).

Explain the class-switch and affinity-maturation events behind the rise (germinal centre). Predict the dominant Ig class and its affinity change. State what the same sample at day 4 would likely have shown. [7]

3.2 A kidney transplant candidate has three siblings (fictional).

Compute the probability that at least one sibling is a full 2-haplotype match (each sibling $1/4$). Explain why HLA-DR matching matters most for outcome. State what ABO mismatch would cause and when. [8]
