Solutions

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

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

2.1

TSH receptor: **Graves disease**

acetylcholine receptor: **myasthenia gravis**

anti-dsDNA: **SLE**

2.2

T cells meet self-peptides on MHC in the thymus medulla

those that bind strongly die by apoptosis

2.3

AIRE makes thymus cells show proteins from other organs

without it, T cells against those proteins are not removed and later attack the organs

2.4

the sore throat is caused by group A streptococcus

the body makes antibodies and T cells against a streptococcal protein (M protein)

these also bind heart proteins (molecular mimicry) and damage the valves

3.1

(a) TRAb switch on the TSH receptor, so T4 is made; high T4 switches off TSH from the pituitary (negative feedback)

(b) **type II**

(c) TRAb are IgG, which cross the placenta

(d) the mother's IgG is broken down and not replaced

(e) HLA genes, infection (mimicry), smoking or female sex

3.2

(a) the **acetylcholine receptor**

(b) there are fewer receptors; with repeated firing less acetylcholine is released, so fewer muscle fibres reach threshold

(c) it blocks acetylcholinesterase, so acetylcholine lasts longer and binds the receptors that are left

3.3

(a) pancreatic β cells, destroyed by T cells

(b) to find relatives at high risk early, for monitoring or trials

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(c) HLA molecules show peptides to T cells; some types show self-peptides well, so self-reactive T cells are more easily switched on

(d) without gluten the antibody falls, giving a false negative

(e) IgA deficiency is more common in coeliac disease; without IgA, an IgA anti-tTG test is falsely negative