Solutions

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

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

2.1

A: **NK cell**

B: **neutrophil**

C: **dendritic cell**

2.2

X: **C3b**, an opsonin

Y: the **membrane attack complex** (C5b–9)

2.3

$0.80 \times 12.0 = 9.6 \times 10^9$/L

above 7.5, so **raised** (neutrophilia)

2.4

a pattern-recognition receptor, **TLR4**

binds **LPS** in the bacterial outer membrane

LPS is a PAMP: made by microbes but not by human cells

3.1

(a) arterioles dilate (vasodilation), so more warm blood flows through the skin

(b) capillaries become leaky, so fluid and protein move into the tissue

(c) **neutrophils**; **CRP**

(d) the liver has to make it after IL-6 from macrophages reaches it

3.2

(a) **C5b–9**

(b) without C7 no membrane attack complex forms; *Neisseria* are killed mainly by complement lysis

(c) meningococcal vaccines (or daily antibiotic prophylaxis)

(d) C3b opsonisation and phagocytosis still work

3.3

(a) **day 1**

(b) **day 3**

(c) only a few T cells recognise the antigen at first; they must be activated in the lymph node and divide many times (clonal expansion)

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(d) they roll on selectins, then stick firmly with integrins and squeeze between endothelial cells

(e) phagocytosis with a burst of reactive oxygen species; enzymes from granules, or nets of DNA (NETs)