

**Model Answers: Hard**

1

The correct answer is **C** because:

- T-lymphocytes are central to the **graft rejection**
- The T cells circulate, some as **helper T cells**, some as **killer T cells**
- The T-lymphocytes all have receptors on the cell surface to recognise **foreign antigens**

**A** is incorrect as B-lymphocytes are not the main cells involved in the rejection of a graft; they must be activated by helper T cells.

**B & D** are incorrect as T-lymphocytes do not produce **antibodies**

2

The correct answer is **D** because:

- A person with blood group **A** and **AB** do not have the **antibodies** in the plasma to type **A**
- If they did have **antibodies** to group A then they would reject blood from this group

**A** is incorrect as **AB** is not the only blood group that would not have the A antibodies

**B & C** are incorrect as blood group O has antibodies to both A and B so would react with the group A antigens

3

The correct answer is **A** because:

- The **helper T** cell will have **receptors** on its cell surface to bind with complementary **antigens** on foreign cells
- The **helper T** cell will then release **cytokines** to stimulate **B-lymphocytes** to divide and form both **plasma cells** and **memory cells**

**B** is incorrect as killer T cells are cytotoxic, not helper, T cells.

**C** is incorrect as helper T cells can divide to form memory cells; it is the memory cells that remain in circulation to enhance a secondary immune response.

**D** is incorrect as Helper T cells do not produce **antibodies**; **plasma cells** derived from B cells produce antibodies.

4

The correct answer is **A** because:

- Cell 1 is a **lymphocyte** as it has a large nucleus that fills most of the cell and is smaller in size compared to the other cells
- Cell 2 is a **monocyte**; they are the largest of all white blood cells and have large oval or kidney-shaped nuclei – when they leave the blood monocytes develop into phagocytes
- Cell 3 is a **neutrophil**; neutrophils are a type of phagocyte with lobed nuclei (2 to 8 lobes)

5

The correct answer is **C** because:

- **T-lymphocytes** are produced in the **bone marrow**
- A transfusion of bone marrow will mean that a child with SCID would be able to produce T-lymphocytes

**A & B** are incorrect as transfusion or continual use of antibodies would provide a treatment, but not a cure. The antibodies would be short-lived in the body and would need to be continually taken.

**D** is incorrect as It is not possible to **vaccinate** individuals to give immunity against all infectious diseases.

6

The correct answer is **A** because **monocytes** are formed in the bone marrow from myeloid stem cells. They circulate in the blood and only develop into **macrophages** once they have left the blood and settled in organs.

**B** is incorrect as a **neutrophil** is a type of phagocytic cell which forms about 60% of white blood cells in the body. Neutrophils are not derived from monocytes.

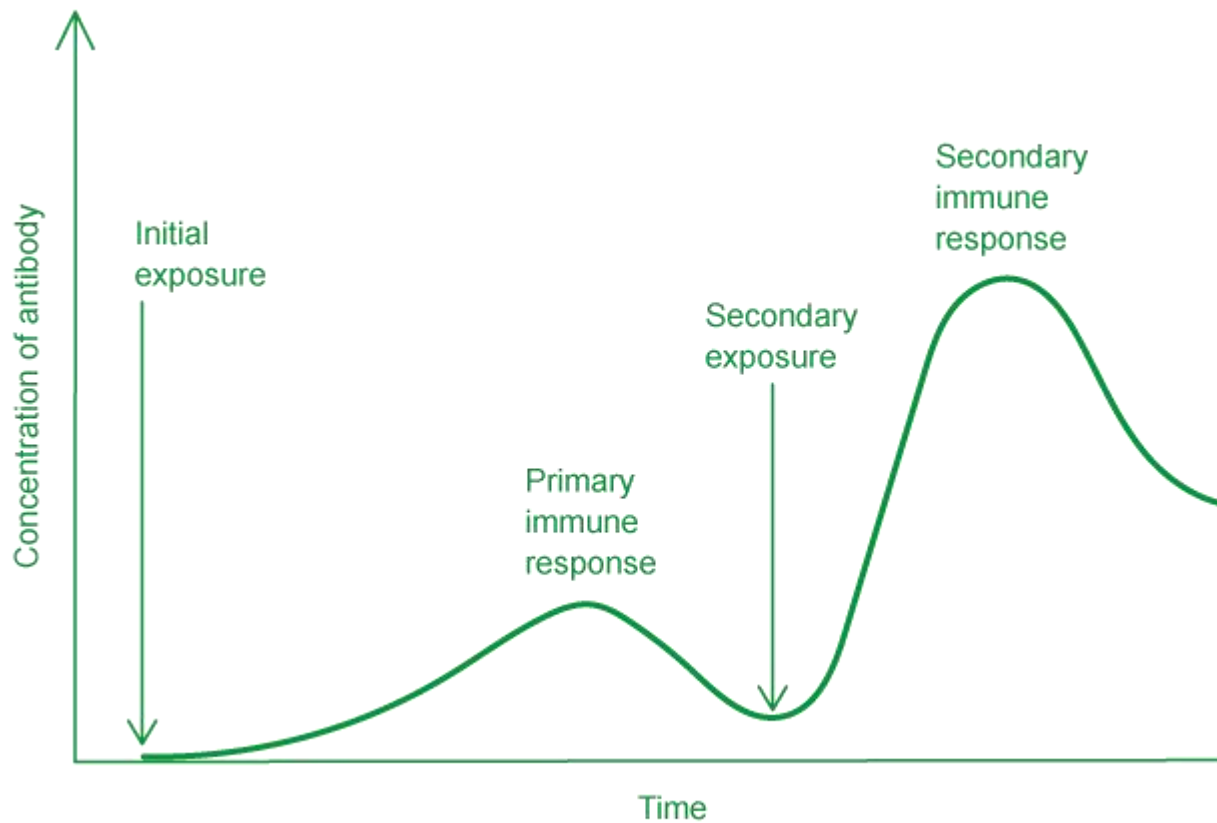
**C & D** are incorrect as both of these cells are lymphocytes, lymphocytes are not a type of **phagocyte**.

7

The correct answer is **B** because:

- The **primary response** will take longer and results in the formation of a lower concentration of antibodies
- The **secondary response** will happen much more quickly, producing a higher number of antibodies (as can be seen in the graph)

below)



**A** is incorrect as the secondary response doesn't just happen in the spleen! (although the spleen does act as a store of lymphocytes)

**C** is incorrect as both primary and secondary responses would result in antibody secretion

**D** is incorrect as a secondary response would increase the number of memory cells produced against a particular antigen.

8

The correct answer is **C** because:

- The adaptive or **acquired immune response** provides the immune system with the ability to **recognize** and act upon specific antigens quickly, giving long term immunity
- Both B-lymphocytes and T-lymphocytes can form memory cells however without T-lymphocytes there is no adaptive response as the T-helper cells release cytokines to activate B-lymphocytes

**A** is incorrect as **plasma cells** are **antibody-producing** cells derived from B-lymphocytes, which are formed when activated T-helper cells release cytokines.

**B** is incorrect as **antibodies** are **proteins**, not cells.

**D** is incorrect as B-lymphocytes are activated by T-helper cells.

9

The correct answer is **D** because:

- The vacuole formed around the bacteria once engulfed by a **phagocyte** is called a **phagosome**
- A **lysosome** fuses with the membrane of the **phagosome** and releases **lysozymes** to digest the pathogen

**A** is incorrect as a vesicle containing lysozymes is a **lysosome**.

**B** is incorrect as a WBC that produces antibodies describes a **plasma cell**.

**C** is incorrect as a WBC that ingests bacteria describes a **phagocyte**.

10

The correct answer is **D** because:

- **Viruses** infect and divide inside cells
- The only cell in the immune system that can recognise and destroy virally infected cells are **cytotoxic T-lymphocytes (T-killer cells)**

**A** is incorrect as **phagocytic macrophages** would not engulf and digest body cells.

**B** is incorrect as activated B lymphocytes either develop into **plasma cells** or **memory cells**.

**C** is incorrect as plasma cells produce **antibodies**.