THE BODY’S DEFENCES AGAINST INFECTION

1\textsuperscript{st} LINE OF DEFENCE (non-specific)  
(e.g. skin, tears, stomach acid)

2\textsuperscript{nd} LINE OF DEFENCE (non-specific)  
(e.g. phagocytes in blood)

3\textsuperscript{rd} LINE OF DEFENCE (specific)  
(e.g. T and B cells)

NON-SPECIFIC RESPONSE MECHANISMS

♦ Non-specific defence mechanisms are those which operate against a range of pathogens and foreign particles such as dust and cigarette ____________.

♦ There are several non-specific defence mechanisms:

1. **Intact skin** - The intact skin provides a barrier to invading pathogens. Also damaged blood vessels rapidly contract to reduce blood loss, and platelets accumulate to create a _______ to prevent further blood loss and invasion of foreign particles.

2. **Mucus-secreting membranes** - Mucus of the _______ traps dust and smoke.

3. **Ciliated membranes** - Hairs of the ____________ tract also trap dust and smoke.

4. **Tears containing lysosome enzymes and lactic acid** - These chemicals are very effective in destroying bacterial cell walls.

5. **Phagocytes** - The inflammatory response involves an increase in blood flow to the area, and ____________ blood cells called phagocytes engulf and digest foreign particles that enter the body tissues.

6. **Complement system** - The inflammatory response also involves transporting large blood proteins that break open or lyse the bacterial cell walls, and attracts phagocytes to the area.

7. **Interferon** - Viral-infected body cells secrete interferon against viruses.

SPECIFIC DEFENCE MECHANISMS

♦ The specific defence mechanisms involve 2 factors:

1. the ability to *recognise* and *respond* specifically against an *antigen* (a molecule on the _______ of an invading bacteria, a toxin produced by the bacteria, or a foreign ____________)

2. the ability to *remember* the chemical structure of the ____________ so the immune response is more rapid at the next encounter
HUMORAL IMMUNITY

B-lymphocytes (B cells) produce specific antibodies that can bind to antigens. Most antibodies are large globular__________, called immunoglobulins that are released into blood. Antibodies also coat foreign particles so that they are recognised and___________ by white blood cells called macrophages. B cells are formed in bone marrow and the spleen, and when they become active, they form 2 types of daughter cells - plasma cells (which make antibodies) and memory cells (which remain in the body for some time and provide a__________-term immunity after a person has encountered a disease).

CELL-MEDIATED IMMUNITY

T-lymphocytes (T cells) are produced in the thymus gland and act against infected or cancerous cells. There are 2 types of T cells - Cytotoxic T cells (directly_______infected or foreign cells) and Helper T cells (assist in regulating the B cells and the cytotoxic T cells).

REJECTION OF TRANSPLANTED ORGANS

All body cells have a group of antigens on their surface that distinguish them as unique (‘self’ recognising cells). Identical twins have________antigens. These antigens are the result of linked genes called the major histocompatibility complex.

After an organ such as a heart or kidney is ________from one person to another person who is not an identical twin, the immune system is triggered. The recipient’s immune system identifies the ‘non-self’ cells of the donor organ. The organ may be ________by the body’s immune system.

To prevent this from happening, immuno-suppressant drugs (e.g. cyclosporin) are given for the rest of the transplant recipient’s ________. Because these drugs reduce the effectiveness of the immune system, the transplant recipient is in danger of contracting other__________.
HYGIENE

- Hygiene involves purification of water, sanitation of sewage and personal hygiene practices (e.g. regular bathing, thorough hand-washing after going to the toilet).

IMMUNISATION

- Immunity may be natural (where a person has suffered and recovered from the disease and sufficient memory B cells to recognise the antigenic molecule and rapidly set up a specific defence against the pathogen) or artificial (following the injection of a specific vaccine, made of altered or killed bacteria, or inactivated forms of the toxin released by some bacteria).

- Active Immunity occurs when an individual’s own immune system ‘recognises, responds and remembers’ the invading pathogen. This is more long-lasting. For example, the triple antigen injections given to young children provide long-term protection against diphtheria, tetanus and whooping cough.

- Passive Immunity occurs when an injection contains the actual antibodies or when a baby receives antibodies via the umbilical cord or breast milk. It is short-term only and requires further injections. For example, the tetanus injection given immediately following a deep wound contains antibodies for immediate treatment.

MONOCLONAL ANTIBODIES

- These are antibodies produced by cloning plasma B cells, and can be produced in large quantities for immunisation. They are also used in pregnancy tests.

ANTIBIOTICS

- An antibiotic is any chemical used to kill or inhibit the growth of a living micro-organism. They are more toxic to the invading pathogen that they are to the host.

- Antibiotics are ineffective against viruses.