

## DISEASE AND IMMUNE SYSTEM ANSWERS

1. (a) A disease is any condition that prevents an organism from functioning effectively in its surroundings.  
(b) An infectious disease is one that is caused by a micro-organism (e.g. bacterium), and can be transmitted. A non-infectious disease is not caused by a micro-organism, and cannot be transmitted
2. Koch's Postulates establish whether a specific micro-organism is the cause of a disease.
  1. The micro-organisms must be observed in the blood or tissues of the infected animal or plant, and must have a reasonable relationship to the disease symptoms.
  2. The organisms must be isolated from the diseased host and grown outside of the body in a pure culture.
  3. A portion of this culture must be injected into a second, previously uninfected animal or plant, and symptoms similar to those in the first host must appear.
  4. The micro-organisms must be observed in and recovered from the experimentally-diseased animal or plant in pure culture.
3. (a) influenza, tinea, malaria (b) anorexia, scurvy, rickets (c) industrial deafness (d) haemophilia, myopia
4. (a) virus (b) bacterium (c) virus (d) bacterium (e) fungus (f) protozoan
5. The 3 types of bacteria are round (coccus), rod-shaped (bacillus) and spiral (spirillum).
6. (a) A parasite is an organism which grows on or in another organism (host), and draws nutrition from the host.
6. (b,c) Parasites may be endoparasites (live inside the host) or ectoparasites (live on the outside of the host).
6. (d) Some organisms (e.g. *Plasmodium* the protozoan that causes malaria, *Echinococcus* the tapeworm which causes hydatids) require more than one host to complete the life cycle. The primary host is the host that is infected by the adult parasite which reproduces inside that host. The secondary or intermediate host is infected by the larval stage of the parasite.
6. (e) A vector (e.g. the *Anopheles* mosquito that transports the malaria protozoan *Plasmodium*) is an organism that transports a parasite from one organism to another without being infected itself.
- 6.(f) A carrier is a person who has pathogenic micro-organisms in his/her body tissues, but does not suffer from the disease.
7. No. Since viruses are not alive, antibiotics have no effect on viral infections.
8. Lack of Vitamin C from fresh fruit and vegetables
9. Reduction in fats and salts in the diet from an early age
10. Blood clotting mechanism is ineffective, so the haemophiliac person often bruises and has difficulty with blood clotting.
11. A benign cancerous tumour does not spread, whereas a malignant cancerous tumour does spread.
12. 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 clot to prevent further blood loss and invasion of foreign particles.  
Mucus-secreting membranes - Mucus of the nose traps dust and smoke.  
Ciliated membranes - Hairs of the respiratory tract also trap dust and smoke.

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

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

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.

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

13. In humoral immunity, B-lymphocytes (B cells) produce specific antibodies that can bind to 2 antigen molecules. Most antibodies are large globular proteins called immunoglobulins that are released into blood plasma. Antibodies also coat foreign particles so that they are recognised and engulfed by 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 lymphatic tissue for some time and provide a long-term immunity after a person has encountered a disease).

In cell-mediated immunity, T-lymphocytes (T cells) are produced in the thymus gland and act against eukaryotic cells such as infected or cancerous cells.

There are 2 types of T cells - Cytotoxic T cells (directly kill infected or foreign cells) and Helper T cells (assist in regulating the B cells and the cytotoxic T cells).

14. Jenner injected cowpox antigens into a person who then make their own antibodies to fight it. These antibodies were capable of fighting the smallpox virus because they were sufficiently chemically alike.

15. Three methods of passive immunity are antibodies that travel between mother and baby through the umbilical or breast milk, and also in injections of antibodies.

16. (a) An allergy is an abnormal hypersensitive response of the immune system to foreign particles that do not affect others (e.g. hayfever).

16. (b) An autoimmune disease is one in which the immune system reacts to normal parts of the body as if they were foreign substances and produces antibodies against the (e.g. rheumatoid arthritis).