Human Health and Diseases

Types of Diseases

Diseases are conditions that cause discomfort, distress, or health problems. They can be congenital (present from birth) or acquired during life. Diseases are broadly classified into infectious and non-infectious types. Infectious diseases are caused by pathogens like bacteria, viruses, protozoa, helminths, and fungi.

Common Infectious Diseases

Bacterial Diseases: Typhoid caused by *Salmonella typhi* spreads through contaminated food and water, causing high fever and abdominal pain. Pneumonia caused by *Streptococcus pneumoniae* spreads via droplets and affects the lungs.

Viral Diseases: Common cold caused by rhinoviruses spreads through droplets. Dengue and chikungunya are transmitted by the bite of infected *Aedes aegypti* mosquitoes, causing fever and joint pain.

Protozoan Diseases: Malaria caused by *Plasmodium* species is transmitted by *Anopheles* mosquitoes. Amoebiasis caused by *Entamoeba histolytica* spreads through

contaminated food and water.

Helminth Diseases: Ascariasis caused by *Ascaris lumbricoides* spreads through contaminated soil and causes intestinal blockage. Filariasis caused by filarial worms spreads through mosquito bites and causes swelling of limbs.

Fungal Diseases: Ringworm caused by fungi like *Microsporum* affects skin and nails, spreading through contact with contaminated objects.

Life Cycle of Plasmodium

The malaria parasite *Plasmodium* has a complex life cycle involving humans and female *Anopheles* mosquitoes. Sporozoites enter human blood through mosquito bites, multiply in liver cells, then infect red blood cells causing fever. Gametocytes develop in blood and are taken up by mosquitoes, where sexual reproduction occurs, producing new sporozoites to infect humans again.

Immune System

The immune system protects the body by recognizing and responding to foreign antigens. It includes lymphoid organs (bone marrow, thymus, spleen, lymph nodes), immune cells (B cells, T cells, macrophages), and antibodies. Immunity is innate (non-specific, present at birth) and acquired (specific, develops after exposure).

Immunity Types

Innate Immunity: Physical barriers like skin, physiological barriers like stomach acid, cellular barriers like phagocytes, and cytokines like interferons provide immediate defense.

Acquired Immunity: Develops after exposure to pathogens. B cells produce antibodies (humoral immunity), and T cells mediate cell-mediated immunity. It has memory for

faster response upon re-exposure.

Immunisation

Immunisation involves active and passive methods. Active immunisation uses vaccines to stimulate antibody production and memory cell formation. Passive immunisation provides ready-made antibodies for immediate protection. Vaccines can be first-generation (live attenuated), second-generation (DNA recombinant), or third-generation (synthetic).

HIV/AIDS

HIV is a retrovirus that infects helper T cells, weakening immunity and leading to AIDS, the advanced immune deficiency stage. Transmission occurs via sexual contact, blood transfusion, infected needles, and mother to child. Diagnosis includes ELISA and PCR tests. Treatment involves antiviral drugs to prolong life. Prevention includes safe sex, blood safety, and avoiding drug abuse.

Cancer

Cancer is uncontrolled cell growth forming tumors. Tumors can be benign (localized) or malignant (spread to other tissues). Types include carcinoma, sarcoma, melanoma, leukemia, and lymphomas. Causes include physical agents (radiation), chemical agents (tobacco smoke), and biological agents (oncogenic viruses). Diagnosis uses biopsy, imaging, and molecular techniques. Treatment includes surgery, radiotherapy, chemotherapy, and immunotherapy.

Solved Examples

Example 1

(i) Name any two helminths pathogenic to humans.

(ii) List two symptoms of diseases caused by one of them.

Solution:

(i) Two pathogenic helminths are *Ascaris lumbricoides* (causes Ascariasis) and *Wuchereria bancrofti* (causes Filariasis).

(ii) Symptoms of Ascariasis include internal bleeding, muscular pain, anemia, and intestinal blockage.

Example 2

(i) Give examples of graft rejections.

(ii) List two symptoms of diseases caused by one of them.

Solution:

Graft rejection occurs when the immune system attacks transplanted tissues. Examples include hyperacute rejection (ABO blood group incompatibility), acute rejection (skin graft rejection), and chronic rejection (heart transplant rejection).

Symptoms of acute rejection include inflammation, fever, and organ dysfunction.

Example 3

A team finds vials labeled with cannabinoids during sports practice.

(i) Should this be reported? Why?

(ii) Name a plant source of cannabinoids.

(iii) Describe effects of cannabinoids on the human body.

Solution:

(i) Yes, report to authorities because cannabinoids are drugs and their abuse is illegal.

(ii) Cannabinoids are obtained from *Cannabis sativa*.

(iii) Cannabinoids affect the brain's cannabinoid receptors and impact the cardiovascular system, potentially causing harmful side effects.

Practice Set

Conceptual Questions

- **Level 1:** What is the difference between innate and acquired immunity?
- **Level 2:** Explain the role of helper T cells and cytotoxic T cells in the immune response.

Application-based Question

- **Level 3:** Describe the life cycle of the malaria parasite and explain how understanding this cycle helps in controlling malaria.

Answer Key

Conceptual Questions

- **Level 1:** Innate immunity is non-specific and present at birth, providing immediate defense through barriers and cells. Acquired immunity is specific, develops after exposure to pathogens, and has memory for faster response.
- **Level 2:** Helper T cells activate other immune cells including B cells to produce antibodies, while cytotoxic T cells destroy infected cells directly.

Application-based Question

- **Level 3:** The malaria parasite's life cycle involves sporozoites entering human blood via mosquito bites, multiplying in liver cells, infecting red blood cells, and producing gametocytes taken up by mosquitoes. Understanding this helps target mosquito control and interrupt transmission.

Drugs and Adolescence

Types of Drugs

Drugs alter nervous system activity and mood. Common types include depressants (sedatives, tranquilisers), opiate narcotics (morphine, heroin), stimulants (cocaine, caffeine), hallucinogens (LSD, cannabinoids), and cannabinoids derived from *Cannabis sativa*.

Effects of Drug Abuse

Drug abuse causes mood changes, addiction, dependence, and health problems like respiratory failure, liver damage, and social issues. Alcoholism affects coordination, vision, and causes diseases like cirrhosis. Smoking causes cancers and respiratory diseases.

Addiction and Dependence

Addiction is psychological attachment requiring increasing doses. Dependence causes withdrawal symptoms like anxiety and nausea when drug use stops.

Prevention and Control

Prevent drug abuse by avoiding peer pressure, education, counseling, seeking help, and rehabilitation programs.

Solved Examples

Example 1

A student finds vials labeled with cannabinoids during sports practice.

(i) Should this be reported? Why?

(ii) Name a plant source of cannabinoids.

(iii) Describe effects of cannabinoids on the human body.

Solution:

(i) Yes, because cannabinoids are drugs and their abuse is illegal.

(ii) Cannabinoids come from *Cannabis sativa*.

(iii) They affect brain receptors and cardiovascular system, causing harmful effects.

Practice Set

Conceptual Questions

- **Level 1:** What are the main types of drugs and their general effects on the nervous system?
- **Level 2:** Explain the difference between addiction and dependence.

Application-based Question

- **Level 3:** Discuss the social and health consequences of alcoholism and suggest preventive measures.

Answer Key

Conceptual Questions

- **Level 1:** Main drug types include depressants (calm brain activity), stimulants (increase activity), hallucinogens (alter perception), and narcotics (pain relief).
- **Level 2:** Addiction is psychological craving needing more drug; dependence causes withdrawal symptoms when drug use stops.

Application-based Question

- **Level 3:** Alcoholism leads to health issues like liver disease, accidents, and social problems. Prevention includes education, counseling, and rehabilitation.

Quick Reference Table

Common Mistakes and Misconceptions

Glossary