

Human Health and Diseases

Health

As per the definition provided by the World Health Organization (WHO), **health** encompasses not only the absence of disease or infirmity but also complete physical, mental, and social well-being. In other words, being healthy means more than just being free of illnesses, but also having optimal physical, mental, and social functioning.

Disease, on the other hand, refers to any disorder or obstacle that impedes the normal functioning of the body and brain. The factors that lead to diseases are known as *causative agents, pathogens, or germs, and can range from viruses and bacteria to environmental factors like pollution and poor nutrition*. By understanding these factors, we can take steps to prevent diseases and promote overall health and well-being.

Classification of Diseases

Diseases are caused by various microorganisms, such as bacteria, viruses, fungi, and protozoans. These can be classified into two categories: **congenital or inherited diseases** and **acquired diseases**.

Congenital or inherited diseases are those that are passed down from one generation to the next, and examples include *haemophilia, color blindness, and sickle-cell anemia*.

Acquired diseases develop after birth due to various factors such as causative agents, nutrient or hormone deficiencies, etc. Examples of acquired diseases include *kwashiorkor, marasmus, night blindness, scurvy, cancer, addiction, arthritis, and allergies*.

Acquired diseases can be further classified into **infectious diseases** (communicable diseases) and non-**infectious diseases** (non-communicable diseases).

Infectious diseases can be transmitted from an infected person to a healthy person and examples include *malaria, typhoid, colds, amoebiasis, AIDS, gonorrhoea, syphilis, hepatitis, and others*.

Non-infectious diseases, on the other hand, cannot be transmitted from person to person and are not caused by pathogens. They are caused by nutritional deficiencies, malfunctioning organs, and other factors. Examples of non-infectious diseases include *cancer, scurvy, and epilepsy*.

Common Infectious Diseases

In humans, infectious diseases are categorized based on the pathogens or causative agents that cause them. Here are some examples:

A. Bacterial Diseases

(i) ***Typhoid***, caused by Salmonella typhi, spreads through contaminated food and water, affecting the small intestine. Symptoms include fever, weakness, stomach pain, constipation, headache, and loss of appetite. The **Widal test** is used for diagnosis.

(ii) ***Pneumonia*** is caused by Streptococcus pneumoniae and Haemophilus influenzae, infecting the alveoli of the lungs, causing breathing difficulties. Symptoms include fever, chills, cough with mucus, and headache.

B. Viral Diseases

(i) The ***common cold***, caused by rhinoviruses, mostly affects the nose and respiratory tract but not the lungs. The virus is transmitted through coughing or sneezing droplets. Symptoms include nasal congestion, sore throat, hoarseness, cough, headache, and tiredness.

(ii) ***Chikungunya***, caused by chikungunya virus and transmitted by Aedes aegypti mosquitoes, causes sudden onset fever, joint pains.

(iii) ***Dengue fever*** is caused by the Flaviribo virus, which is transmitted through the bite of female Aedes and Culex mosquitoes. While there is no specific cure for dengue, analgesics can be used to alleviate fever and other symptoms. These symptoms may include high fever, headaches, nausea, joint pain, and vomiting.

(iv) ***Acquired Immuno Deficiency Syndrome (AIDS)*** is a fatal disorder that is caused by the Human Immunodeficiency Virus (HIV), a retrovirus. The virus can be transmitted through body fluids, including sexual contact, sharing contaminated needles, and from an infected mother to her child through the placenta. As the disease progresses, the patient's immune system becomes weakened and unable to protect the body from common infections.

Various diagnostic tests, such as ***Enzyme Linked Immuno Sorbent Assay (ELISA)***, ***Polymerase Chain Reaction (PCR)***, and ***Western Blot***, can be used to detect HIV infection. However, there is currently no cure for HIV, and antiviral drugs can only help prolong the life of the patient but cannot prevent death.

Prevention and control methods for AIDS include screening blood banks for HIV, using disposable needles and syringes, promoting condom use during sexual activity, and encouraging regular HIV testing.

C. Protozoan disease caused by single-celled organisms that can cause a range of health issues in humans. Two examples of such diseases are ***malaria*** and ***amoebiasis***.

- (i) **Malaria** is caused by the Plasmodium protozoan in the form of **sporozoites**. It requires two hosts to complete its lifecycle. The primary host for the asexual cycle is the female ***Anopheles mosquito***, while the secondary host for the sexual cycle is humans. Different species of Plasmodium, such as *P. ovale*, *P. falciparum*, *P. vivax*, and *P. malariae*, can cause malaria. During a *Plasmodium vivax* infection, **haemozoin** is released into the blood every 24 hours. Malaria symptoms include shaking chills, headaches, muscle pain, nausea, vomiting, diarrhoea, and in severe cases, anaemia and jaundice.
- (ii) **Amoebiasis**, also known as **amoebic dysentery**, is caused by the Entamoeba histolytica protozoan found in the large intestine of humans. This is a hostile parasite that has an infectious stage known as a trophozoite. Amoebiasis is commonly transmitted by houseflies through the focal-oral route. Symptoms of amoebiasis include constipation, abdominal pain, cramps, stools with excess mucus, and blood clots.

D. Helminthic diseases are caused by parasitic worms and can result in serious health problems in humans. Two examples of such diseases are **ascariasis** and **filariasis**

(i) **Ascariasis** is caused by the helminth parasite Ascaris lumbricoides, which is an intestinal parasite. It can be transmitted through contaminated water, vegetables, fruits, and other sources. Symptoms of ascariasis include internal bleeding, muscular pain, fever, anemia, and blockage of the intestinal passage.

(ii) **Filariasis**, also known as **Elephantiasis**, is caused by the digenetic parasite Wuchereria bancrofti and W. malayi. Humans are the primary host, while the female *Culex fatigans* mosquito is the secondary host. Symptoms of filariasis include chronic inflammation that develops slowly over many years, mostly in the lymphatic vessels of the lower limbs. Genital organs can also be affected.

Fungal diseases are caused by fungi such as Microsporium, Trichophyton, and Epidermophyton. These fungi are generally acquired from the soil or through direct contact with contaminated articles used by an infected person. Symptoms of fungal diseases, such as ringworms, include dry, scaly lesions on various parts of the body, including the skin, nails, and scalp, accompanied by intense itching.

Preventive Measures for Infectious Diseases

- (i) Personal hygiene, such as regular bathing, clean drinking water, and clean food, is crucial to prevent the spread of infectious diseases.
- (ii) Public hygiene measures, such as proper disposal of waste and excreta, periodic cleaning and disinfection of water reservoirs and pools, are also important to prevent the spread of diseases.
- (iii) Vector-borne diseases like malaria can be prevented by eradicating vectors, destroying their breeding sites, using mosquito nets and repellents, avoiding water stagnation, introducing mosquito-eating fishes like *Gambusia* in ponds and spraying insecticides in open water bodies.

- (iv) For airborne diseases, avoid direct contact with infected persons or their belongings.
- (v) Vaccination and immunisation are effective ways to prevent infectious diseases by stimulating the immune system's memory. During vaccination, antigenic proteins or weakened pathogens are injected in the body to neutralize the causal agent. When preformed antibodies are injected to achieve immunisation, it is called passive immunisation, for example, in the case of snake bites.

Non-Infectious Diseases

Cancer is one of the most well-known non-infectious diseases. Cancer cells possess a unique property called contact inhibition, which means that their uncontrolled growth stops when they come into contact with other cells. However, cancerous cells lack this property and continue dividing uncontrollably, resulting in the formation of tumours or neoplasms.

Tumours are masses of cells formed due to uncontrolled cell division. They can be classified into two types: **benign** and **malignant**. **Benign tumours** remain localized in their original location and do not spread throughout the body, while **malignant tumours** consist of proliferating cells known as neoplastic or tumour cells that grow rapidly, invade, and damage surrounding normal cells.

Cancer is caused by agents called **carcinogens**, which include physical agents such as X-rays, γ -rays, and UV-rays, as well as chemical agents such as tobacco smoke and benzene fumes. Some viruses, called **oncogenic viruses**, are biological agents that cause cancer. These viruses contain **viral oncogenes**, while other genes are called **cellular oncogenes (c-onc)** or **proto-oncogenes**.

Several methods can be used to detect cancer, such as blood and bone marrow tests, biopsy, radiography, computed tomography (CT) scans, magnetic resonance imaging (MRI), and monoclonal antibodies.

Various methods are involved in the treatment of cancer, including surgery, radiotherapy, and chemotherapy.

Immunity

The ability of the body to defend against disease-causing agents is known as **immunity**. There are two types of immunity:

Note • Interferon Small protein molecules synthesized in the body during viral infection are called **interferons**. They provide semi-specific protection to the body.

- (i) **Innate immunity** refers to the defence elements that an individual is born with. It is non-specific, meaning it is not targeted to a particular pathogen.
- (ii) **Acquired immunity** is pathogen-specific immunity that develops during an individual's lifetime. It is further classified into two categories:

(a) **Active Immunity**, which is the immunity developed by the body when exposed to antigens such as living or dead microbes or other proteins. The body produces antibodies in this case. Active immunity can be either natural or artificial.

(b) **Passive Immunity**, which is the immunity conferred by the direct administration of antibodies to the body. It is quick but lasts only for a few days. For example, antibodies (IgG) received by the fetus from the mother through the placenta.

Immune responses

The Immune system is responsible for protecting the body from harmful pathogens. There are two main types of immune responses: **primary response** and **secondary response**.

The **primary response** occurs when the body encounters a pathogen for the first time. This response is of low intensity, and the details of the encounter are stored in the cell memory for future reference.

On subsequent encounters with the same pathogen, the **secondary** or **anamnestic response** is elicited. This response is highly intense and is aided by the memory of the primary encounter. Both the primary and secondary responses are carried out with the help of **T-lymphocytes and B-lymphocytes**.

The Immune response mediated by B-lymphocytes is known as the **humoral immune response**, while the immune response mediated by T-lymphocytes is called **Cell-Mediated Immunity (CMI)**. These responses work together to protect the body from harmful pathogens.

Antigens, also known as **immunogens**, are substances that enter the body and stimulate the production of antibodies. **Antibodies** are a type of **immunoglobulin**, which is a class of proteins produced in response to antigenic stimulation. Antibodies bind to antigens with the help of covalent bonds.

There are different types of antibodies, including **IgG, IgA, IgM, IgE, and IgD**. Each type of antibody has a unique function in the immune system.

It's important to note that vaccines are either a cell suspension or a byproduct excreted by the cell. When introduced into the body, vaccines stimulate the production of antibodies, which can help protect against future exposure to the pathogen. **Vaccines** are a crucial tool in preventing the spread of infectious diseases.

Allergy refers to the exaggerated or hypersensitive response of the immune system to certain agents present in the environment. These causative agents are known as **allergens**, such as dust, mites, pollens, animal dander, and more. The antibodies produced in response to allergens are of **IgE** type.

Autoimmunity is a state where the body loses the ability to distinguish between self and non-self-cells. This leads to the immune system going off track and starting to destroy self cells and molecules. This ultimately results in autoimmune diseases such as rheumatoid arthritis, Addison's disease, Hashimoto's disease, and more. It's important to note that autoimmune diseases can have a significant impact on an individual's health and quality of life.

Immune system

The immune system is a complex network of **lymphoid organs, tissues, cells, and antibodies** that work together to protect the body from harmful pathogens. It is a vital component of human physiology that plays a crucial role in maintaining our health and well-being.

The Immune system is divided into two main categories: **primary** and **secondary lymphoid organs**. **The primary lymphoid organs**, bone marrow, and thymus, are the sites where immature lymphocytes differentiate and proliferate. These organs are responsible for producing and maturing the cells that will form the basis of the immune system.

On the other hand, **secondary lymphoid organs** are the sites where lymphocytes interact with antigens to become effector cells. These organs are the **spleen, lymph nodes, and Mucosal Associated Lymphoid Tissue (MALT)**. In these organs, the immune system launches an attack against the pathogens that have entered the body, producing a highly specialized response to eliminate the foreign invaders.

In summary, the immune system is a highly complex and coordinated network of organs, tissues, cells, and molecules that work together to protect the body from harmful pathogens. The primary and secondary lymphoid organs play a vital role in this process, helping to create, develop, and deploy the immune response that keeps us healthy and safe.

Adolescence

Adolescence is a phase of rapid physical and mental growth that marks the transition from childhood to adulthood. Unfortunately, during this phase, many young people fall prey to substance abuse. Some of the commonly abused drugs are **opioids, cannabinoids, cocaine, hallucinogens, and tobacco**.

Opioids: are psychotropic drugs that affect the central nervous system and gastrointestinal tract. Examples include heroin and morphine. **Cannabinoids**, on the other hand, affect the cannabinoid receptors in the brain and include substances such as hemp, hashish, charas, and ganja.

Coca alkaloid or cocaine: obtained from **Erythroxylum coca**, interferes with the transport of dopamine, resulting in a sense of euphoria and increased energy. Hallucinogens, obtained from plants like Atropa belladonna and Datura stramonium, alter the cerebrum and sense organs and are also known as psychedelic drugs. Lysergic Acid Diethylamide (LSD), derived from Claviceps purpurea (fungus), is a hallucinogenic substance.

Tobacco: derived from the tobacco plant (*Tabacum nicotiana*), contains nicotine, which stimulates the adrenal gland. These substances can have severe negative consequences for the developing brains and bodies of adolescents and should be avoided.

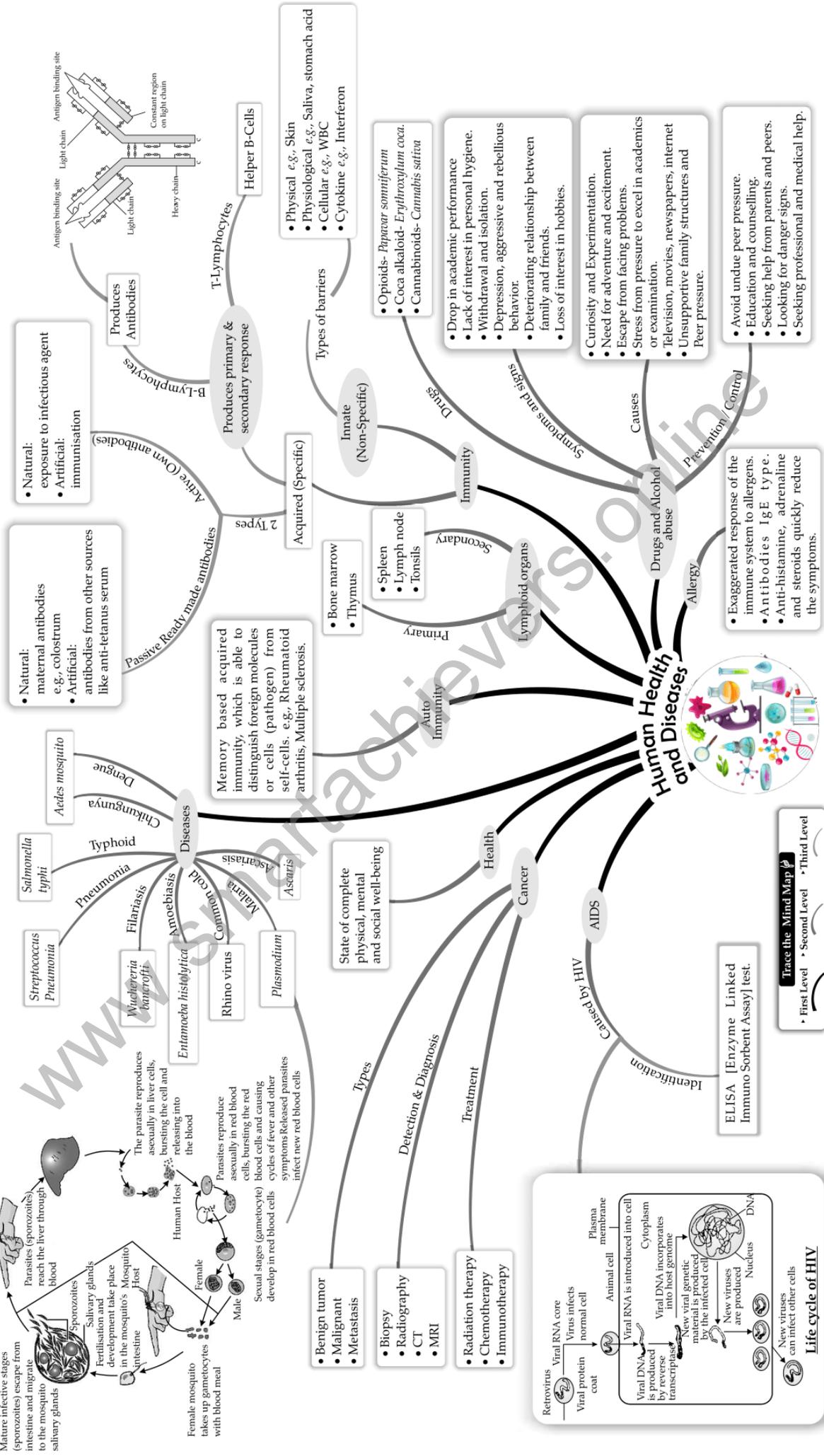
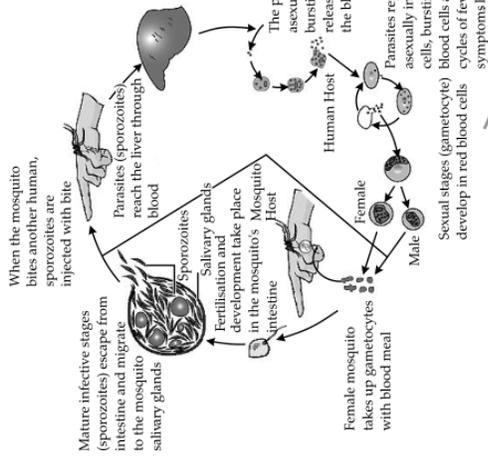
Effects of drugs and alcohol abuse

The abuse of drugs and alcohol can have a profound impact on individuals, particularly adolescents. The following are some of the effects that substance abuse can have:

- (i) **Behavioural changes**, including unsocial attitudes, lack of interest, involvement in anti-social activities, violence, depression, withdrawal, and isolation.
- (ii) Poor hygiene, lack of appetite, weight loss, and disinterest in hobbies.
- (iii) Decreased academic performance, truancy, and absence from school or college.
- (iv) Mental and financial crises, which can lead to the habit of stealing.
- (v) Chronic damage to the nervous system, resulting in liver cirrhosis, cardiac problems, and respiratory issues.

Prevention and control of drug and alcohol abuse: requires a concerted effort from parents, teachers, and affected individuals. The following steps can be taken to prevent substance abuse:

- (i) Parents should strive to understand their children and develop a strong bond with them.
- (ii) Both parents and teachers should educate and counsel adolescents about the negative effects of drug and alcohol abuse.
- (iii) Affected individuals should seek professional help from psychologists, doctors, and rehabilitation centres to overcome their problems.



9. The tendency of the body to manifest a characteristic and unpleasant withdrawal syndrome on abrupt discontinuation of regular dose of drugs/alcohol is called

- A) Depression b) Dependence c) Abnormalty d) All of these

10. Regarding common cold consider the following statements

I. Rhinovirus is responsible for common cold which infects the nasal epithelium and respiratory passage but not the lungs

II. The symptoms of common cold included nasal congestion and discharge, sore throat, gruffiness, cough, headache and tiredness

Which of the statement given above is/are correct?

- a) Only I b) Only II c) I and II d) None of these

11. Mast cells have important role in the development of

- a) Allergens b) Allergy c) Inflammation d) Both (b) and (c)

12. Which of the following is related to humoral immunity?

- a) T-lymphocyte b) B- lymphocyte c) I- lymphocyte d) P- lymphocyte

13. Note the following words.

- I. Skin II. Phagocytes
III. B-cells IV. Inflammation
V. Antibodies VI. T-cells
VII. Fever VIII. Antimicrobial proteins
IX. NK-cells X. Secretions

Identify the factors involved in second line of defence.

- a) II, IV, VII and IX b) II, III, V and IX
c) IV, VI, VIII and X d) III, V, VII and VIII

14. BCG vaccine is used against

- a) TB b) Leprosy c) Food poisoning d) None of these

15. Allergens are

- a) Infectious and increased secretion of IgE b) Non-infectious and increased secretion of IgE
c) Infectious and increased secretion of IgG d) Non-infectious and increased secretion of IgM

16. Smoking results in ...A... build up in the blood and reduce ...B... delivery to the tissue.

Here A and B refers to

- a) A-carbon dioxide; B-carbon monoxide b) A-carbon dioxide; B-oxygen
c) A-carbon monoxide; B-oxygen d) A-oxygen; B-carbon monoxide

17. What is true about T-lymphocytes in mammals?

- a) They scavenge damaged cells and cellular debris
b) These are produced in thyroid
c) There are three main types-cytotoxic T-cells, helper T-cells and suppressor T-cells
d) These originate in lymphoid tissues

18. The thymus is a lobed organ located near the ...A... and beneath the ...B... . The most appropriate combination for A and B is

- a) A-heart; B-breast bone b) A-liver; B-ribs
c) A-heart; B-ribs d) A-intestine; B-ribs

19. Which of the following disease is caused by Entamoeba histolytica

- a) Malaria b) Amoebiasis c) Typhoid d) Filariasis

20. Consider the following statements

I. Neural system and endocrine system influences our immune system

II. Immune system maintains our health

Which of the statement (s) given above is/are correct?

- a) Only I b) Only II c) I and II d) None of these

21. Which of the given sets include lymphatic organs?

- a) Thymus, lymph nodes and spleen b) Liver, spleen and thymus
c) Tonsils, Peyer's patches and liver d) Thymus, liver and tonsils

22. Which of the following is not a part of secondary lymphatic system?

- a) Spleen b) Lymph nodes c) Tonsils d) Thymus

23. Which of the following toxic substances is responsible for the high malarial fever?

- a) Haemoglobin b) Haemocyanin c) Haemozoin d) Haemoriden

24. A chemical substance produced by a microorganism for inhibiting the growth of another is

- a) Antibody b) Antibiotic c) Aflatoxin d) Antiallergic

25. Carcinoma refers to

- a) Malignant tumour of the colon
b) Benign tumour of the connective tissue
c) Malignant tumour of the connective tissue
d) Malignant tumour of the skin or mucous membrane

26. Heroin is a

- a) Diacetyl morphine b) Morphine c) Hemp d) Stimulant

27. Monoclonal antibodies are used for

- a) Immune suppression for kidney transplantation
- b) Growth induction
- c) Suppression of symptoms of rabies
- d) Treatment of breast cancer

28. Non-specific host defence that exists prior to the exposure to an antigen is called

- a) Acquired immunity
- b) Passive immunity
- c) Innate immunity
- d) Active immunity

29. Cancer of the internal organs is detected by

- a) Radiography
- b) Computed tomography
- c) Magnetic resonance imaging
- d) All of the above

30. Which one of the following is correctly matched?

- a) Body louse - Typhoid
- b) House fly - Yellow fever
- c) Anopheles - Malaria
- d) Aedes - Plague

31. After drinking alcohol, a person walks clumsily because, the alcohol affects his

- a) Cerebellum
- b) Cerebrum
- c) Medulla oblongata
- d) Spinal cord

32. An uncontrolled division or proliferation of cells without any differentiation is called

- a) Cancer
- b) AIDS
- c) Filariasis
- d) None of these

33. AIDS virus is also known as

- a) HIV
- b) HTLV-III
- c) LAV
- d) All of these

34. Opioids are the drugs, which bind to specific opioid receptors present in our

- a) Central nervous system
- b) Gastrointestinal tract
- c) Both (a) and (b)
- d) Urinogenital system

44. Cannabinoid are the group of chemicals, which interact with cannabinoid receptors present principally in

- a) Brain b) Neuron c) Nephron d) Dendron

45. Histamines or other, inflammation producing substances are formed by

- a) Macrophages b) Interferons c) Mast cells d) Collagen tissue

46. Tobacco contains

- a) Nicotine b) Amphetamine c) Carbon monoxide d) Both (a) and (c)

47. Cannabis sativa is the source of

- a) Opium b) LSD c) Marijuana d) Cocaine

48. Which of the following is a pair of bacterial diseases?

- a) Typhoid and Pneumonia b) Malaria and AIDS
c) Ringworm and AIDS d) Cold and Malaria

49. The polypeptide chains present in gamma immunoglobulin are

- a) 2 b) 4 c) 6 d) 8

50. Fungi belonging to genera are responsible for

- a) Ringworm b) Skin allergy c) Amoebiasis d) Measles

Answer

1. Answer: b) 1 December

Explanation: World AIDS Day is observed on December 1 every year to raise awareness about HIV/AIDS, commemorate those who have died from the disease, and support people living with HIV.

2. Answer: c) Histamines

Explanation: Histamines are released by mast cells and basophils during an allergic response. They cause vasodilation, increased vascular permeability, and smooth muscle contraction, leading to the symptoms of an allergic reaction.

3. Answer: b) Passive immunity

Explanation: Colostrum is the first milk produced by a mother after giving birth. It contains high levels of antibodies, which provide passive immunity to the infant. This means that the infant can receive temporary protection against diseases until its own immune system becomes fully functional.

4. Answer: b) IgA

Explanation: IgA antibodies are secreted by mucosal tissues, such as those in the respiratory and digestive tracts, and are the most abundant antibodies in the body. They play an important role in defending against infections at mucosal surfaces.

5. Answer: a) Mast cells

Explanation: Mast cells are involved in allergic and inflammatory reactions, as well as immediate hypersensitivity. They release histamines, cytokines, and other mediators that cause inflammation and promote immune responses.

6. Answer: c) Alkaline phosphatase

Explanation: ELISA (enzyme-linked immunosorbent assay) is a commonly used diagnostic test that can detect viruses, among other things. Alkaline phosphatase is often used as the key reagent in ELISA because it can produce a colored or fluorescent signal that indicates the presence of a target molecule.

7. Answer: c) Pneumonia

Explanation: Pneumonia is an infection that inflames the air sacs in one or both lungs, which can cause symptoms such as fever, chills, cough, headache, and difficulty breathing. In severe cases, the lips and fingernails may appear gray or bluish due to poor oxygenation.

8. Answer: a) Bone marrow

Explanation: The bone marrow is the primary site of blood cell production, including lymphocytes. Lymphocytes are a type of white blood cell that plays a crucial role in the immune system.

9. Answer: b) Dependence

Explanation: Dependence is a condition that can develop with regular use of drugs or alcohol, in which the body becomes accustomed to the presence of the substance and experiences withdrawal symptoms when it is abruptly discontinued.

10. Answer: c) I and II

Explanation: Rhinovirus is responsible for the majority of common cold cases and it infects the nasal epithelium and respiratory passage but not the lungs, which makes statement I correct. The symptoms of common cold included nasal congestion and discharge, sore throat, gruffness, cough, headache, and tiredness, making statement II correct. Therefore, the correct answer is option c.

11. Answer: d) Both (b) and (c)

Explanation: Mast cells play a significant role in both allergic reactions and inflammatory responses. When activated, mast cells release a variety of chemicals, including histamine, which causes the symptoms of allergies such as itching, swelling, and redness. In addition, mast cells play a critical role in inflammation by recruiting other immune cells to the site of injury or infection. Therefore, the correct answer is option d.

12. Answer: b) B-lymphocyte

Explanation: B-lymphocytes are white blood cells that play a key role in humoral immunity, which is the branch of the immune system that involves the production of antibodies. When activated, B-cells differentiate into plasma cells, which produce and secrete large amounts of antibodies that can recognize and neutralize pathogens. Therefore, the correct answer is option b.

13. Answer: a) II, IV, VII and IX

Explanation: The second line of defense is the innate immune system, which includes nonspecific defenses that provide immediate protection against pathogens. The factors involved in the second line of defense include phagocytes (II), inflammation (IV), fever (VII), and natural killer (NK) cells (IX), making option a) the correct answer.

14. Answer: a) TB

Explanation: The BCG vaccine is used primarily to prevent tuberculosis (TB). It contains a weakened strain of *Mycobacterium bovis*, which can stimulate the immune system to provide protection against *M. tuberculosis*, the bacteria that causes TB. Therefore, the correct answer is option a.

15. Answer: b) Non-infectious and increased secretion of IgE

Explanation: Allergens are substances that can trigger an allergic reaction. They are typically non-infectious substances such as pollen, dust mites, or certain foods.

16. The correct answer is c) A-carbon monoxide; B-oxygen. Smoking results in the build-up of carbon monoxide in the blood which reduces the delivery of oxygen to the tissues.

17. The correct answer is c) There are three main types-cytotoxic T-cells, helper T-cells, and suppressor T-cells. T-lymphocytes, also known as T-cells, are produced in the bone marrow and mature in the thymus gland. They play a crucial role in the immune response by recognizing and targeting specific antigens.

18. The correct answer is c) A-heart; B-ribs. The thymus is a lobed organ located near the heart and beneath the ribs. It is responsible for the maturation of T-cells and plays an important role in the immune system.

19. The correct answer is b) Amoebiasis. *Entamoeba histolytica* is a parasite that causes amoebiasis, which is an infection of the intestines. It is transmitted through contaminated food and water and can cause diarrhea, abdominal pain, and other symptoms.

20. The correct answer is c) I and II. The immune system is influenced by both the neural and endocrine systems, and it plays a critical role in maintaining our overall health by protecting us from infection and disease.

21. The correct answer is a) Thymus, lymph nodes, and spleen. The thymus, lymph nodes, and spleen are all lymphatic organs. The lymphatic system plays an important role in the immune system by filtering and removing harmful substances from the body.

22. d) Thymus

Explanation: The secondary lymphatic system includes the spleen, lymph nodes, and tonsils. The thymus, however, is part of the primary lymphatic system, which is responsible for the production and maturation of T-cells.

23. c) Haemozoin

Explanation: Haemozoin is a byproduct of the digestion of hemoglobin by the malaria parasite in red blood cells. It can stimulate the production of proinflammatory cytokines, leading to high fever in malaria patients.

24. b) Antibiotic

Explanation: Antibiotics are a class of drugs that are produced by microorganisms to kill or inhibit the growth of other microorganisms.

25. d) Malignant tumour of the skin or mucous membrane

Explanation: Carcinoma is a type of cancer that starts in the epithelial cells, which are the cells that line the skin or the mucous membranes of organs.

26.a) Diacetyl morphine

Explanation: Heroin is a derivative of morphine that is made by acetylating two of the hydroxyl groups on morphine, producing diacetylmorphine.

27.d) Treatment of breast cancer

Explanation: Monoclonal antibodies are laboratory-produced molecules that are designed to mimic the immune system's ability to fight off harmful pathogens, cancer cells, or other foreign substances in the body. They can be used to target specific proteins on the surface of cancer cells, helping the immune system to destroy them.

28.c) Innate immunity

Explanation: Innate immunity is the first line of defense against pathogens and other foreign substances that enter the body. It includes physical barriers (such as the skin), chemical barriers (such as stomach acid), and various cells and molecules of the immune system that can recognize and destroy pathogens.

29.d) All of the above

Explanation: Radiography, computed tomography (CT), and magnetic resonance imaging (MRI) can all be used to detect cancerous tumors in internal organs.

30.c) Anopheles – Malaria

Explanation: Anopheles mosquitoes are the primary vectors of the malaria parasite, which is transmitted to humans through their bites. Body lice are associated with typhus fever, while houseflies and Aedes mosquitoes are not associated with either typhoid or plague but can transmit other diseases.

31. Answer: a) Cerebellum

Explanation: The cerebellum is the part of the brain responsible for motor coordination and balance. Alcohol affects the cerebellum, which leads to loss of coordination, unsteady gait and difficulty in maintaining balance.

32. Answer: a) Cancer

Explanation: Cancer refers to the uncontrolled growth and division of abnormal cells that can invade and damage adjacent tissues and organs. It arises due to mutations or alterations in the genetic material of cells that control cell growth and division.

33. Answer: d) All of these

Explanation: AIDS virus is also known as Human Immunodeficiency Virus (HIV), Human T-cell Lymphotropic Virus Type III (HTLV-III) and Lymphadenopathy-Associated Virus (LAV).

34. Answer: c) Both (a) and (b)

Explanation: Opioids are a class of drugs that act on specific receptors in the brain and gastrointestinal tract to produce pain relief, sedation, and euphoria. The receptors are present in both the central nervous system and gastrointestinal tract.

35. Answer: b) Serratia – Drug Addiction

Explanation: Serratia is a genus of bacteria that is not associated with drug addiction. Streptomyces produces many antibiotics, Spirulina is a source of single cell protein and Rhizobium is used as a biofertilizer.

36. Answer: a) Erythroxyllum coca

Explanation: Cocaine is a powerful stimulant drug that is obtained from the leaves of the coca plant, Erythroxyllum coca.

37. Answer: d) four

Explanation: Antibodies are composed of four protein chains – two heavy chains and two light chains. The variable segments are present in the antigen-binding region of both the heavy and light chains.

38. The incubation period for hepatitis-B virus is b) 30-180 days. The incubation period is the time between when a person is infected with a virus and when they start to show symptoms. In the case of hepatitis-B virus, this period can range from 30 to 180 days. During this time, the virus is replicating in the liver, but the person may not show any symptoms.

39. The main barrier which prevents the entry of disease-causing organisms in our body is a) Skin. Skin is the first line of defense of our immune system, acting as a physical barrier that prevents pathogens from entering our body. It contains sweat and oil glands, which produce substances that have antimicrobial properties, helping to protect against infections.

40. The primary host of Plasmodium is d) Female Anopheles. Plasmodium is a genus of parasitic protozoans that causes malaria. The primary host for the Plasmodium species that infect humans is the female Anopheles mosquito. When the mosquito feeds on a person infected with Plasmodium, it ingests the parasites along with the person's blood. The parasites then develop inside the mosquito and are transmitted to another person when the mosquito feeds again.

41. Benign tumors are normally confined to their original location and do not spread to other parts of the body. The correct answer is c) Benign tumor. Unlike malignant tumors, which can invade nearby tissues and spread to other parts of the body, benign tumors are usually slow-growing and remain localized. They can cause problems if they grow too large and press on nearby tissues or organs, but they are not considered cancerous.

42. Protein deficiency leads to a) Kwashiorkor and b) Marasmus. Both of these conditions are types of malnutrition caused by a lack of protein in the diet. Kwashiorkor typically affects young children and is characterized by swelling, skin rashes, and a swollen liver, while Marasmus is a more severe form of protein-energy malnutrition that results in wasting of muscle and fat tissue.

43. In AIDS, the system which shows failure is c) Defense system. AIDS (Acquired Immune Deficiency Syndrome) is a disease caused by the human immunodeficiency virus (HIV), which attacks the immune system, making it difficult for the body to fight off infections and diseases. As a result, people with AIDS are more susceptible to opportunistic infections and cancers that would not normally affect healthy individuals.

44. Cannabinoids are the group of chemicals that interact with cannabinoid receptors present principally in a) Brain. Cannabinoids are a group of compounds that interact with the endocannabinoid system (ECS) in the body. The ECS is a complex network of receptors and signaling molecules that help to regulate various physiological processes, including appetite, pain, mood, and immune function. The cannabinoid receptors are primarily located in the brain, but they are also present in other parts of the body, such as the immune system, digestive system, and peripheral nervous system.

45. c) Mast cells

Histamines are chemical substances that cause inflammation in the body. They are produced by certain types of white blood cells, including mast cells, which are found in connective tissue and contain histamine-filled granules. When mast cells are activated, they release histamine, which causes blood vessels to dilate and become more permeable, leading to the characteristic symptoms of inflammation, such as redness, swelling, and warmth.

46. d) Both (a) nicotine and (c) carbon monoxide

Tobacco contains many harmful chemicals, including nicotine, a highly addictive stimulant, and carbon monoxide, a poisonous gas that reduces the amount of oxygen that the blood can carry. Both of these chemicals are harmful to health and are responsible for many of the negative effects of smoking, such as lung cancer, heart disease, and stroke.

47. c) Marijuana

Cannabis sativa is a plant that is the source of several psychoactive drugs, including marijuana. The active ingredient in marijuana is delta-9-tetrahydrocannabinol (THC), which produces a range of effects on the central nervous system, including euphoria, altered sensory perception, and impaired memory and judgment.

48. a) Typhoid and Pneumonia

Typhoid is a bacterial disease caused by the bacterium *Salmonella typhi*, which is spread through contaminated food and water. Pneumonia is a bacterial infection of the lungs, usually caused by *Streptococcus pneumoniae*, but can also be caused by other bacteria, viruses, or fungi.

49.b) 4

Gamma immunoglobulin, also known as IgG, is a type of antibody that is involved in the immune response to foreign substances in the body. It is made up of four polypeptide chains: two heavy chains and two light chains, which are linked together by disulfide bonds.

50.a) Ringworm

Ringworm is a common fungal infection of the skin, hair, and nails. It is caused by a variety of fungi belonging to the genera *Microsporum*, *Trichophyton*, and *Epidermophyton*.

Ringworm is characterized by a red, circular rash that may be scaly, itchy, or blistered, and can occur anywhere on the body.

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