

7 Human Health and Diseases

Fastrack Revision

- ▶ Health can be defined as a state of complete physical, mental and social well-being.
- ▶ Health is affected by three factors:
 - **Genetic disorders**, disorders which the child inherits from parents from birth.
 - **Infections**, caused due to pathogens.
 - **Life style**, includes the habits that we have or lack such as intake of food and water, rest and exercise which we give to our body etc.
- ▶ When people are healthy, they are more efficient to work which increases productivity and brings economic prosperity.
- ▶ The factors which are responsible for maintaining good health are:
 - **Balanced diet**, the diet which contains all kinds of essential nutrients in a proportionate manner.
 - Personal hygiene.
 - Regular exercise, meditation and yoga.
- ▶ Aspects which are needed to be added to achieve good health are:
 - Awareness about diseases.
 - Proper disposal of wastes.
 - Control of vectors.
 - Maintenance of hygiene.

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The World Health Day is celebrated every year on 7th April.

Diseases

- ▶ The conditions in which one or more organs of the body are not working properly, characterised by various signs and symptoms are called **diseases**.
- ▶ The organisms which cause diseases are called **pathogens**.
- ▶ Diseases can be broadly classified into two types:
 1. **Infectious Diseases**: Infectious diseases are those which are transmitted from an infected person to another healthy person.
Infectious diseases include:
 - **Bacterial diseases**, caused by bacteria.
 - **Viral diseases**, caused by virus.
 - **Protozoan diseases**, caused by protozoan.
 - **Helminthes diseases**, caused by helminthes.
 - **Fungal diseases**, caused by fungi.
 2. **Non-infectious Diseases**: Non-infectious diseases are those which are not transmitted from an infected person to another person.

Bacterial Diseases

Some of the most common bacterial diseases are:

- ▶ **Typhoid**
 - Caused by *Salmonella typhi*.
 - Affects small intestine and then migrates to other parts of the body through blood.
 - Transmitted by contaminated food and water.
 - Common symptoms are sustained high fever (39° to 40°C), weakness, stomach pain, constipation, headache, loss of appetite, intestinal perforation and death may occur in severe cases.
 - Typhoid fever is confirmed by **Widal test**.
- ▶ **Pneumonia**
 - Caused by bacteria like *Streptococcus pneumoniae* and *Haemophilus influenzae*.
 - Affects alveoli of lungs.
 - Transmitted by droplets released by infected person, sharing glasses and utensils.
 - Common symptoms are fever, chills, cough and headache and in severe cases, lips and finger nails turn grey to bluish colour.

Viral Diseases

- ▶ The most common viral disease is **common cold**.
 - Caused by *Rhino virus*.
 - Affects nose and respiratory organs.
 - Transmitted by direct inhalation of droplets from cough and sneeze of infected person, through contaminated objects like pen, books, cups etc.
 - Nasal congestion and discharge, sore throat, hoarseness, cough are common symptoms.

Protozoan Diseases

Some of the human diseases caused by protozoans are:

- ▶ **Malaria**
 - Caused by *Plasmodium* (*P. vivax*, *P. malariae* and *P. falciparum*).
 - Affects liver and RBC.
 - Transmits by biting of female *Anopheles* mosquito which acts as a vector.
 - High fever occurring on alternate days, chill, vomiting are the common symptoms.
 - Malarial parasite requires two hosts to complete their life cycle..... Human and *Anopheles* mosquito.
- ▶ **Life Cycle of Malarial Parasite**
 - Female *Anopheles* mosquito bites a healthy human and injects sporozoites (infective stage) with its bites.
 - The parasites reach the liver through blood and starts multiplying within the liver cells.
 - Parasites then attack the red blood cells and reproduce asexually. They rupture the red blood cells which release a toxic substance called **haemozoin** responsible for chill and high fever recurring every 3 to 4 hours.



- Some of the parasites differentiate into male and female gametocytes which are taken up by the mosquito during biting and sucking blood.
- Formation of gametes and fertilisation takes place in the intestine of mosquito.
- The zygote develops and forms thousands of sporozoites which migrate into the salivary gland of the mosquito.
- When the mosquito bites another human, the sporozoites are injected.
- **Amoebiasis (Amoebic Dysentery)**
 - Caused by *Entamoeba histolytica*.
 - Affects large intestine of man.
 - Transmitted by house flies which act as mechanical carrier and food gets contaminated with cysts of *Entamoeba*.
 - Constipation, abdominal pain, cramps, stools with mucus and blood clots are common symptoms.

Helminth Diseases

Some of the common helminth diseases are:

- **Ascariasis**
 - Caused by *Ascaris lumbricoides*.
 - Affects intestine of man.
 - Transmitted by contaminated water, vegetables, fruits etc.
 - Internal bleeding, muscular pain, fever, anaemia, blockage of intestinal passage are common symptoms.
- **Filariasis or Elephantiasis**
 - Caused by *Wuchereria bancrofti* and *Wuchereria malayi*.
 - Affects lymphatic vessels of the lower limbs and genital organs.
 - Transmitted by biting of infected female *Culex* mosquito.
 - Chronic inflammation of the organs where they live, abnormal swellings of the lower limbs, scrotum, penis are common symptoms.

Fungal Disease

- One of the most common infectious fungal disease is **Ringworm**.
 - Caused by *Microsporum*, *Trichophyton*, *Epidermophyton*.
 - Affects skin, nails, folds of skin, groin.
 - Transmitted by sharing towel, clothes, or even comb with infected person.
 - Appearance of dry skin, scaly lesions in nails and scalp with intense itching are some of the common symptoms.
 - Heat and moisture help these fungi to grow.
- **Prevention and Control of Diseases**
 - Maintenance of hygiene is very important for prevention and control of diseases.
 - Measures for hygiene include keeping the body clean; consumption of clean drinking water, food, vegetables, fruits; proper disposal of waste and excreta; periodic cleaning and disinfection of water reservoirs, pools, cesspools and tanks.
 - In case of air borne diseases, close contact with the infected person and his belongings should be avoided.
 - For vector borne diseases such as malaria and filariasis, the measures to control diseases are:
 - Control or eliminate the vectors and their breeding places.

- Avoiding stagnation of water in and around residential areas.
- Regular cleaning of household coolers.
- Use of mosquito nets.
- Introducing fishes like *Gambusia* in ponds that feed on mosquito larvae.
- Spraying of insecticides in ditches, drainage areas and swamps, etc.
- Doors and windows should be provided with wire mesh to prevent the entry of mosquitoes.
- The use of vaccines and immunisation programme has enabled to control diseases like smallpox, diphtheria, polio, pneumonia, tetanus etc.

Immunity

- The overall ability of the body to fight against disease causing microorganisms with the help of immune system is called immunity.
- Immunity is of two types: Innate Immunity and Acquired immunity.

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- The study of body's defence mechanisms against pathogens is called Immunology.
- Edward Jenner is known as Father of Immunology.

Innate Immunity

- The immunity which occurs by birth is called **innate immunity**.
- Innate immunity is non-specific type of defense.
- Innate immunity consists of various barriers which prevent the entry of microorganisms into the body.
- Innate immunity consists of four types of barriers:
 - **Physical Barriers:** Skin on our body is the main barrier which prevents entry of the microorganisms. Mucus coating of the epithelium lining the respiratory, gastrointestinal and urogenital tracts also help in trapping microbes entering our body.
 - **Physiological Barriers:** Acid in the stomach, saliva in the mouth, tears from eyes—all prevent microbial growth.
 - **Cellular Barriers:** Certain types of leukocytes (WBC) of our body like polymorpho-nuclear leukocytes (PMNL-neutrophils), monocytes and natural killer (type of lymphocytes) in the blood as well as macrophages in tissues can phagocytose and destroy microbes.
 - **Cytokine Barriers:** Virus-infected cells secrete proteins called **interferon** which protect noninfected cells from further viral infection.

Acquired Immunity

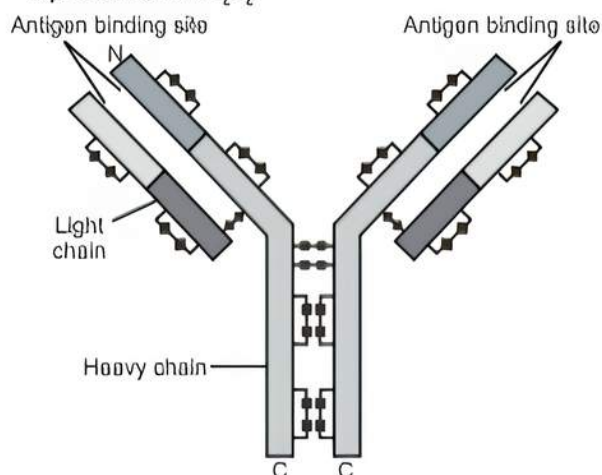
- The immunity which develops during lifetime by exposure to suitable foreign agents like microorganisms is called **acquired immunity**.
- Acquired immunity is pathogen specific and it is characterised by memory.
- When the body first encounters a pathogen, it produces a response which takes long time to develop and is of low intensity also called as **primary immune response** and if the body encounters the same pathogen, it produces highly intensified and quick response called as **secondary immune response**.



- After responding to the foreign microorganisms and elimination of the pathogen, the immune system keeps the memory of that encounter (primary response) and during its second encounter with the same pathogen produces a highly intensified immune response (secondary response).
- The primary and secondary immune responses are carried out with the help of two special types of lymphocytes present in our blood:
 - **B-lymphocytes:** The B-lymphocytes produce an army of proteins in response to pathogens into our blood to fight with them called as **antibodies**.
 - **T-lymphocytes:** The T-cells themselves do not produce antibodies but help B-cells to produce them.

➤ Structure of Antibody

- Each antibody molecule has four peptide chains, two long chains and two short chains arranged in a Y-shaped structure.
- Two long chains are called **heavy chains** and two short chains are called **light chains**, hence an antibody is represented as H_2L_2 .



- Antibodies are also called as **immunoglobulin (Ig)**.
- Different types of antibodies are produced in our bodies which are IgA, IgM, IgE, IgG.

Categories of Immunity

- Based on the type of immune cell acting against the antigens, immunity can be classified into two types:
 - **Humoral Immunity:** The immunity which is mediated by antibodies produced by B-lymphocytes is called humoral immunity.
 - **Cell-mediated Immunity:** The immunity which is mediated by T-lymphocytes by directly attaching themselves to the antigens is called cell-mediated immunity.

During organ transplantation, tissue matching and blood group matching are essential before undertaking any graft/transplant and even after this, the patient has to take immuno-suppressants throughout his/her life because the body is able to differentiate 'self' and 'non-self' and the cell-mediated immune response is responsible for the graft rejection.

- Based on the nature of antibodies, immunity is divided into two types:

- **Active Immunity:** When a host is exposed to antigens, which may be in the form of living or dead microbes or other proteins, antibodies are produced in the host body, this type of immunity is called active immunity.
Example: antibody produced when any microorganism enters the body.
- **Passive Immunity:** When readymade antibodies are directly given to protect the body against foreign agents, this type of immunity is called passive immunity.
Example: The yellowish fluid **colostrum** secreted by mother during the initial days of lactation has abundant antibodies (IgA) to protect the infant. The foetus also receives some antibodies from their mother through the placenta during pregnancy.

➤ Vaccination and Immunisation

- **Vaccination** is the process of introduction of vaccines into the body to produce antibodies against the antigens to neutralise the effect of pathogens during actual infection.
- **Vaccines** are the dead or weakened pathogens introduced into the body.
- The dead or weakened pathogen leads to the production of antibodies which neutralises the pathogenic agents during actual infection with the same pathogen.
- **Immunisation** is the process where performed antibodies against the toxin are introduced into the body.
Example: Performed antibody injection against snake venom.
- Using recombinant DNA technology, antigenic polypeptides of pathogens can be produced in bacteria or yeast.
Example: Hepatitis-B vaccine produced from yeast.

➤ Allergy

- The exaggerated response of the immune system to certain antigens present in the environment is called **allergy**.
- The substances to which immune response is produced are called **allergens**.
- Common examples of allergens are mites in dust, pollens, animal dander etc.
- Allergy is due to the release of chemicals like histamine and serotonin from the mast cells.
- The antibodies produced to these allergens are of IgE type.
- Symptoms of allergic reactions include sneezing, watery eyes, running nose and difficulty in breathing.
- The patient is diagnosed by injecting or exposing the patient to very small doses of allergens.
- Drugs like anti-histamine, adrenalin and steroids quickly reduce the symptoms of allergy.

➤ Auto-Immunity

- In auto-immunity, the immune system of body is able to identify and differentiate between self and non-self.
- Due to genetic and other unknown reasons, the body attacks self-cell which results in damage to the body and is called **auto-immune disease**.
- **Rheumatoid arthritis** is an auto-immune disease.

➤ Immune System in the Body

- Immune system consists of: lymphoid organs, lymphoid tissues, B-cells and T-cells and antibodies.



► Lymphoid Organs

- The organs where origin and/or maturation and proliferation of lymphocytes occur are called **lymphoid organs**.
- Lymphoid organs are of two types: **Primary lymphoid organs** and **Secondary lymphoid organs**.
- The primary lymphoid organs are **bone marrow** and **thymus** where immature lymphocytes differentiate into antigen-sensitive lymphocytes.
- The bone marrow is the main lymphoid organ where all blood cells including lymphocytes are produced.
- The thymus is a lobed organ located near the heart and beneath the breastbone.
- Spleen, tonsil, lymph node, Peyer's patches of small intestine and appendix are secondary lymphoid organs where proliferation of lymphocytes take place.
- The secondary lymphoid organs provide the sites for interaction of lymphocytes with the antigen, which then proliferate to become effector cells.
- The spleen is a large bean-shaped organ that mainly contains lymphocytes and phagocytes which act as a filter of the blood by trapping blood-borne microorganisms and has a large reservoir of erythrocytes.
- The lymph nodes are small solid structures located at different points along the lymphatic system.
- Lymph nodes serve to trap the antigens and these antigens trapped are responsible for the activation of lymphocytes and cause the immune response.

► Lymphoid Tissues

- Lymphoid tissues are located within the lining of the respiratory, digestive and urogenital tracts.
- Lymphoid tissues are also called **Mucosal Associated Lymphoid Tissue (MALT)** which constitutes about 50% of the lymphoid tissue in human body.

► AIDS

- The term AIDS stands for **Acquired Immune Deficiency Syndrome**.
- The disease is acquired during life time.
- AIDS is caused by **Human Immune Deficiency Virus (HIV)**.
- HIV is a retrovirus having RNA as the genetic material.

► Mode of Transmission

- Sexual contact with infected persons.
- By transfusion of contaminated blood and blood products.
- By sharing infected needles as in the case of intravenous drug abusers.
- From infected mother to her child through placenta.

► Life Cycle of HIV

- After getting into the body, the virus enters into macrophages or T-helper cells.
- The viral RNA genome gets replicated to form viral DNA with the enzyme called **reverse transcriptase**.
- The viral DNA gets incorporated into the host cell's DNA and directs the infected cells to produce virus particles and the macrophages continue to produce virus.
- Viruses released from macrophages attack T-helper cells and cause a progressive reduction in the number of T-helper cells. Due to this, the person starts suffering from infections with several other microorganisms.

► Diagnosis and treatment

- Diagnosed by **ELISA (Enzyme-Linked Immunosorbent Assay)**.
- Treated with anti-retroviral drugs but that is only partially effective.

► Prevention of AIDS

- To follow safe blood transfusion.
- To use disposable needles.
- To distribute free condoms.
- To prevent drug abuse.

► Cancer

- Cancer is the uncontrolled cell division leading to the formation of a mass of cells called as a **tumor**.
- **Contact inhibition** is the property of normal cells by virtue of which contact with other cells inhibits their uncontrolled growth.
- Cancer cells lost the property of contact inhibition and as a result of this, cancerous cells continue to divide giving rise to masses of cells called tumors.
- Tumors are of two types: benign and malignant.
- **Benign tumors** normally remain confined to their original location and do not spread to other parts of the body.
- The **malignant tumors** are a mass of proliferating cells called neoplastic or tumor cells.
- Malignant tumors grow very rapidly, invade and ultimately damage surrounding tissues.
- The most feared property by which cancer cells move to distant places from their origin by blood and invade the normal cells to make them cancerous is called as **metastasis**.

► Causes of Cancer

- Transformation of normal cells into cancerous cells may be induced by physical, chemical or biological agents called as **carcinogens**.
- Physical carcinogens are ionising radiations like X-rays, gamma rays and non-ionising radiations like UV radiation of sun.
- Chemical carcinogens are tobacco smoke and some other chemicals.
- Biological carcinogens include viral oncogenes and cellular oncogenes.
 - Cancer causing viruses are called oncogenic viruses which have genes called **viral oncogenes**.
 - **Cellular oncogenes** or proto-oncogenes in normal cells, when get activated lead to oncogenic transformation of normal cells.

► Detection of Cancer

- Biopsy and histo-pathological study of the tissues and blood.
- Radiography by using X-rays, CT (Computed Tomography).
- MRI (Magnetic Resonance Imaging).
- Use of antibodies against cancer-specific antigens.

► Treatment of Cancer

- Surgery
- Radiation therapy
- Chemotherapy
- Biological response modifiers such as alpha-interferon which activate the immune system and help in destroying the tumor.

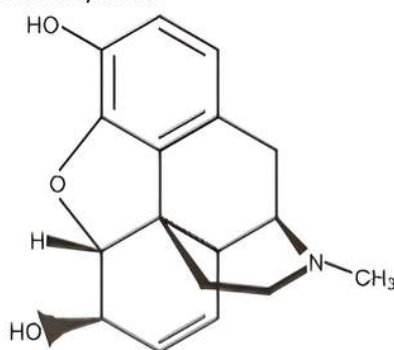


Drugs and Alcohol Abuse

The drugs which are commonly abused are opioids, cannabinoids and coca alkaloids.

► Opioids

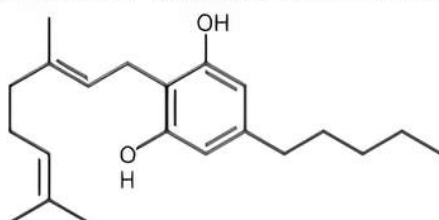
- Opioids are the drugs which bind to specific opioid receptors present in our central nervous system and gastrointestinal tract.
- **Heroin** commonly called **smack** is chemically diacetylmorphine which is a white, odourless, bitter crystalline compound and is obtained by acetylation of morphine extracted from the latex of poppy plant, *Papaver somniferum*.



- Heroin is a depressant and slows down body functions.

► Cannabinoids

- Cannabinoids interact with cannabinoid receptors present principally in the brain.
- Natural cannabinoids are obtained from the inflorescences of the plant *Cannabis sativa*.



- The flower tops, leaves and the resin of *Cannabis* plant are used in various combinations to produce marijuana, hashish, charas and ganja.
- They have adverse effects on cardiovascular system of the body.

► Coca Alkaloid

- Coca alkaloid or cocaine is obtained from coca plant *Erythroxylum coca*, a native to South America.
- Coca alkaloid interferes with the transport of the neuro-transmitter dopamine.
- Cocaine is commonly called as **coke** or **crack**.
- It has a potent stimulating action on central nervous system, producing a sense of euphoria and increased energy.
- Excessive dosage of cocaine causes hallucinations.
- Some plants with hallucinogenic properties are *Atropa belladonna* and *Datura*.
- Drugs like barbiturates, amphetamines, benzodiazepines, Lysergic acid Diethyl amides (LSD) that are used as medicines to help patients cope with mental illnesses like depression and insomnia, are often abused.
- Morphine, a very effective sedative and painkiller, is often abused.

► Tobacco

- Tobacco contains **nicotine**, an alkaloid.
- Nicotine stimulates adrenal gland to release adrenaline

and nor-adrenaline hormones into blood both of which raise blood pressure and increase heart rate.

- Smoking of tobacco is associated with increased incidence of cancers of lung, urinary bladder, throat, oral cavity, bronchitis, emphysema, coronary heart disease, gastric ulcer etc.

► Adolescence and Drug/Alcohol Abuse

- Adolescence means both 'a period' and 'a process' during which a child becomes mature in terms of his/her attitudes and beliefs for effective participation in society.
- 12-18 years of age may be thought of as adolescence period.
- Adolescence is accompanied by several biological and behavioural changes.
- Curiosity, need for adventure and excitement, and experimentation, constitute common causes, which motivate youngsters towards drug and alcohol use.

► Addiction and Dependence

- **Addiction** is a psychological attachment to certain effects, such as euphoria and a temporary feeling of well-being is associated with drugs and alcohol.
- With repeated use of drugs, the tolerance level of the receptors present in our body increases and consequently the receptors respond only to higher doses of drugs or alcohol leading to greater intake and addiction.
- **Dependence** is the tendency of the body to manifest a characteristic and unpleasant withdrawal syndrome if regular dose of drugs/alcohol is abruptly discontinued.
- Withdrawal syndrome is characterised by anxiety, shakiness, nausea and sweating.

► Effects, Prevention and Control of Drug/Alcohol Abuse

- Immediate adverse effects are reckless behaviour, vandalism and violence.
- Excessive doses of drugs may lead to coma and death due to respiratory failure, heart failure or cerebral hemorrhage.
- Those who take drugs intravenously can get infected with serious infections like AIDS and hepatitis-B.
- The chronic use of drugs and alcohol damages nervous system and cause liver **cirrhosis**.
- The use of drugs and alcohol during pregnancy is also known to adversely affect the foetus.
- Use of anabolic steroids in females can cause masculinisation, increased aggressiveness, mood swings, depression, abnormal menstrual cycles, excessive hair, growth on the face and body, enlargement of clitoris, deepening of voice etc.
- In males, anabolic steroids can cause acne, increased aggressiveness, mood swings, depression, reduction of size of the testicles, decreased sperm production, potential for kidney and liver dysfunction, breast enlargement, premature baldness, enlargement of the prostate gland.

► Prevention and Control

The measures useful in prevention and control of alcohol and drugs abuse among adolescents are:

- Avoid undue peer pressure on children.
- Children should be educated and counseled to bear problems and stress in life.
- The child should seek help from parents and elders.
- Affected individuals should seek medical help of qualified psychologists, psychiatrists, and deaddiction and rehabilitation programmes.



Practice Exercise



Multiple Choice Questions

- Q 1. Which one of the following disease is non-communicable?
 a. Diphtheria b. Flu
 c. Cancer d. Malaria
- Q 2. Which of the following pairs contains an infectious and a non-infectious disease respectively?
 a. Typhoid and AIDS
 b. AIDS and cancer
 c. Pneumonia and malaria
 d. Cancer and malaria
- Q 3. Typhoid fever in human beings is caused by:
 a. *Plasmodium vivax* b. *Trichophyton*
 c. *Salmonella typhi* d. *Rhinovirus*
- Q 4. Which of the following pairs correctly matches a disease and a pathogen causing it?
 a. Typhoid – *Salmonella typhi*
 b. Pneumonia – *Haemophilus pneumoniae*
 c. Malaria – *Ascaris lumbricoides*
 d. Ringworm – *Entamoeba histolytica*
- Q 5. A person with sickle cell anaemia is:
 a. more prone to malaria
 b. more prone to typhoid
 c. less prone to malaria
 d. less prone to typhoid
- Q 6. The substance produced by a cell in viral infection that can protect other cells from further infection is:
 a. serotonin b. colostrum
 c. interferon d. histamine
- Q 7. A toxic substance, responsible for the chills and high fever recurring every three to four days in malarial fever, is:
 a. interferon b. haemozoin
 c. hirudin d. colostrum
- Q 8. Antibodies present in colostrum which protect the newborn from certain diseases is of:
 a. IgG type b. IgA type
 c. IgD type d. IgE type
- Q 9. The antibody which can cross placental barrier is:
 a. IgA b. IgE
 c. IgM d. IgG
- Q 10. The most abundant class of immunoglobulins (Igs) in the body is:
 a. IgA b. IgG
 c. IgE d. IgM
- Q 11. Select the pathogen mismatched with the symptoms of disease caused by it from the list given below:
 a. *Entamoeba histolytica* : Constipation, abdominal pain.
 b. *Epidermophyton* : Dry scaly lesions on nail.
 c. *Wuchereria bancrofti* : Chronic inflammation of lymphatic vessels of lower limb.
 d. *Haemophilus influenzae* : Blockage of the intestinal passage.

- Q 12. Tetanus antitoxin (Tetanus toxoid) when injected into the human body, it immediately provides:
 a. Innate immunity b. Passive immunity
 c. Auto immunity d. Active immunity
- Q 13. A patient was advised to have a kidney transplant. To suppress the immune reaction, the doctor would administer him: (CBSE SQP 2023-24)
 a. statins produced from *Monascus purpureus*
 b. statins produced from *Streptococcus thermophilus*
 c. cyclosporin A produced from *Trichoderma polysporum*
 d. cyclosporin A produced from *Clostridium butylicum*
- Q 14. The decrease in the T-lymphocytes count in human blood will result in: (CBSE 2023)
 a. Decrease in antigens
 b. Decrease in antibodies
 c. Increase in antibodies
 d. Increase in antigens
- Q 15. 'Smack' is a drug obtained from the:
 a. latex of *Papaver somniferum*
 b. leaves of *Cannabis sativa*
 c. flowers of *Datura*
 d. fruits of *Erythroxylum coca*
- Q 16. Tobacco consumption is known to stimulate secretion of adrenaline and nor-adrenaline. The component causing this could be:
 a. nicotine b. tannic acid
 c. curcumin d. catechin



Assertion & Reason Type Questions

Directions (Q.Nos. 17-24): Each of the following questions consists of two statements, one is Assertion (A) and the other is Reason (R). Select the correct answer to these questions from the codes a, b, c and d as given below.

- a. Both Assertion and Reason are true and Reason is the correct explanation of Assertion.
 b. Both Assertion and Reason are true but Reason is not the correct explanation of Assertion.
 c. Assertion is true but Reason is false.
 d. Assertion is false but Reason is true.
- Q 17. Assertion (A): There is no chance of transmission of malaria to man on the bite of a male *Anopheles* mosquito.
 Reason (R): It carries a non-virulent strain of *Plasmodium*.
- Q 18. Assertion (A): *Streptococcus pneumoniae* and *Haemophilus influenzae* are responsible for causing infectious disease in human beings.
 Reason (R): A healthy person acquires the infection by inhaling the droplets/aerosols released by an infected person.



- Q 19. Assertion (A): Some diseases that attack in childhood do not attack again.
Reason (R): Memory cells play an important role.
- Q 20. Assertion (A): Immunoglobulin functions as antibody.
Reason (R): Different immunoglobulin molecules have different antigen binding properties.
- Q 21. Assertion (A): Immunity means all capacity of human body to resist almost all types of organisms or toxins that tend to damage the tissues and organs.
Reason (R): Spleen is the only organ involved in immunity.
- Q 22. Assertion (A): Cancer patients are given chemotherapeutic treatments.

Reason (R): Chemotherapeutic agents are used to destroy malignant cells.

- Q 23. Assertion (A): Smoking can raise blood pressure and increase heart rate.

Reason (R): Nicotine stimulates adrenal glands to release adrenaline and nor-adrenaline into the blood circulation, both of which raise blood pressure and increase heart rate. (CBSE SQP 2023-24)

- Q 24. Assertion (A): Psychotropic drugs affect behaviour and mental activities.

Reason (R): Tranquilliser, a psychotropic drug decrease tension and anxiety.

Answers

- (c) Cancer
- (b) AIDS and cancer
Infectious diseases are those diseases that can spread from one person to another e.g., AIDS. Non-infectious diseases are those diseases that cannot spread from one person to another, e.g., cancer.
- (c) *Salmonella typhi*
Salmonella typhi, a rod-shaped bacterium causes typhoid.
- (a) Typhoid — *Salmonella typhi*
Typhoid — *Salmonella typhi*
Pneumonia — *Streptococcus pneumoniae*
Malaria — *Plasmodium*
Ringworm — *Trichophyton*
- (c) less prone to malaria
- (c) Interferon
- (b) haemozoin
In malaria, chills and shivers are caused by the release of toxic substance, haemozoin into the blood at the time of RBC rupture. It is generally followed by fever.
- (b) IgA type
- (d) IgG
IgG is the only maternal immunoglobulin that can cross the placenta and provide natural passive immunity to the foetus. It is the most abundant class of immunoglobulins in the body constituting 80% of the Igs.
- (b) IgG
- (d) *Haemophilus Influenzae*: Blockage of the intestinal passage.
- (b) Passive Immunity
- (c) cyclosporin A produced from *Trichoderma polysporum*
- (b) Decrease in antibodies
- (a) latex of *Papaver somniferum*
- (d) catechin
Tobacco contains a large number of chemical substances including nicotine, an alkaloid. Nicotine

stimulates adrenal gland to release adrenaline and nor-adrenaline into blood circulation, both of which raise blood pressure and increase heart rate.

- (c) Assertion is true but Reason is false.
- (b) Both Assertion and Reason are true but Reason is not the correct explanation of Assertion.
A healthy person acquires the infection by inhaling the droplets/aerosols released by an infected person or even by sharing glasses and utensils with an infected person.
- (a) Both Assertion and Reason are true and Reason is the correct explanation of Assertion.
After the infection disappears as a result of antigen-antibody interaction, some of the specific lymphocytes remain in lymphatic tissue as memory or primed cells that give rise to more effector cells and memory cells in case of a second attack of antigens. The effector cells have a life of a few days only and the memory cells live long, some even for whole life. That is why the second attack of the infectious disease elicit quick response.
- (b) Both Assertion and Reason are true but Reason is not the correct explanation of Assertion.
- (c) Assertion is true but Reason is false.
- (a) Both Assertion and Reason are true and Reason is the correct explanation of Assertion.
- (a) Both Assertion and Reason are true and Reason is the correct explanation of Assertion.
- (b) Both Assertion and Reason are true but Reason is not the correct explanation of Assertion.



Case Study Based Questions

Case Study 1

Communicable Disease

Riya studies in IIInd standard in a government school. She belongs to a backward family and her parents did not get her properly vaccinated according to immunisation programme. Once while playing in school playground she fell

down due to weakness and developed high fever, headache and stiffness in her neck. Identify the illness she could be suffering from and answer the following questions:

- Q 1. The microbe responsible for Riya's illness could be:**
a. *Vibrio cholerae* b. *Enterovirus*
c. *Plasmodium* d. *Mycobacterium*
- Q 2. Which vaccine, if administered earlier, would have saved Riya from the illness she unfortunately contracted?**
a. Salk vaccine b. MMR vaccine
c. Varicella vaccine d. BCG vaccine
- Q 3. The disease that Riya has contracted spreads through:**
a. bite of an infected mosquito.
b. bite of an infected dog.
c. faecal oral route.
d. direct contact with the infected person.
- Q 4. Riya can spread her illness to other children through:**
a. her faeces
b. direct contact
c. coughing and sneezing in open
d. vectors
- Q 5. Assertion (A):** Polio produces inflammation of the nervous system.
Reason (R): Stiffness of the neck and paralysis of particular skeletal muscle is an important symptom of polio.
a. Both Assertion and Reason are true, and Reason is the correct explanation of Assertion.
b. Both Assertion and Reason are true, but Reason is not the correct explanation of Assertion.
c. Assertion is true, but Reason is false.
d. Assertion is false but Reason is true.

Answers

1. (b) 2. (a) 3. (c) 4. (a) 5. (b)

Case Study 2

Non-communicable Disease

Rajesh, Ravi and Rohit are roommates. They are doing their graduation. Few months back Ravi fell ill. It took him around 3 weeks to recover. Both his friends were absolutely healthy at that time. After sometime, Rajesh also fell ill from some other disease. This time Ravi and Rohit both contracted the same illness.

- Q 1. Which of the following holds true for Ravi's illness?**
a. Ravi was suffering from a communicable disease that is transmitted through vector.
b. Ravi was suffering from a communicable disease that is transmitted through faecal oral route.
c. Ravi was suffering from a non-communicable disease like anaemia.
d. Ravi was suffering from a non-communicable disease like Down's syndrome.

Q 2. Select the correct statement:

- a. Ravi contracted a disease caused by air borne microbes.
b. Ravi could have suffered a nutritional disorder.
c. Ravi suffered a non-contagious disease.
d. Both b. and c.

Q 3. Which could be correctly said for Rajesh's illness?

- a. Rajesh's illness was due to a microbial infection.
b. Rajesh's illness could be contagious or non-contagious.
c. Rajesh's illness could be cured by antibiotics.
d. All of the above.

Q 4. Which of the following may depict Ravi's and Rajesh's illness?

Ravi	Rajesh
a. Sickle cell anaemia	Myocardial Infarction
b. Whooping cough	Tetanus
c. Gastritis	Rhinitis
d. Hypertension	Thyroid

Q 5. Assertion (A):

 Diabetes mellitus is a non-communicable disease which can be completely cured.

Reason (R): Diabetes mellitus is caused by deficiency of aldosterone hormone.

- a. Both Assertion and Reason are true, and Reason is the correct explanation of Assertion.
b. Both Assertion and Reason are true, but Reason is not the correct explanation of Assertion.
c. Assertion is true, but Reason is false.
d. Both Assertion and Reason are false.

Answers

1. (c) 2. (d) 3. (d) 4. (c) 5. (d)

Case Study 3

Diseases in Human

X and Y are communicable diseases whereas W and Z are non-communicable diseases. X is transmitted through vectors whereas Y is transmitted through droplet infection. W is caused due to a hormone deficiency whereas Z is a degenerative disease.

Q 1. Identify W, X, Y and Z.

	W	X	Y	Z
a.	Coronary artery disease	Cholera	Chikungunya	Hypertension
b.	Diabetes	Malaria	Rhinitis	Alzheimer's disease
c.	Arthritis	AIDS	Shigella	Plague
d.	Gonorrhoea	Diphtheria	Pertussis	Anthrax

Q 2. Select the correct statement:

- a. If X is sleeping sickness, then its vector is *Leishmania*.
b. If Y is diphtheria, then it is caused by *Bacillus anthracis*.

- c. If W is hypothyroidism, then it is caused by deficiency of thyroxine hormone.
- d. If Z is myocardial infarction, then patient develops acute rheumatic fever, joint pain and throat infection.

Q 3. If X and Y both are usual diseases, then which of the following holds true?

- a. X could be dengue caused by flavivirus and Y could be AIDS caused by HIV.
- b. X could be chikungunya whereas Y could be rhinitis.
- c. X could be hepatitis whereas Y could be rabies.
- d. X could be chicken pox caused by Varicella zoster virus whereas Y could be yellow fever caused by flavivirus.

Q 4. If X and Y both are bacterial diseases, then select the correct match from the following:

- a. X- Bubonic plague - *Yersinia pestis*
- b. Y- Leprosy - *Mycobacterium leprae*
- c. X- Whooping cough - *Bordetella pertussis*
- d. Y- Botulism - *Clostridium botulinum*

Q 5. Assertion (A): Communicable diseases could be contagious or non-contagious.

Reason (R): Diseases that spread through vectors are non-contagious diseases.

- a. Both Assertion and Reason are true, and Reason is the correct explanation of Assertion.
- b. Both Assertion and Reason are true, but Reason is not the correct explanation of Assertion.
- c. Assertion is true, but Reason is false.
- d. Assertion is false but Reason is true.

Answers

1. (b) 2. (c) 3. (b) 4. (a) 5. (b)

Case Study 4

Aditya went to his hometown located in countryside along with his parents during his summer vacations. His grand parents' house is surrounded by farmland from all sides. Lots of crops were growing nearby and Aditya was very excited to visit the crop fields. He sought permission from his mother to play in farmland along with his friends and then went to play in the fields. On returning back he had running nose, watering eyes and continuous sneezing which was very frequent. The symptoms worsened with time.

Read the given passage carefully and give the answer of the questions that follows:

Q 1. What could be the possible reason for Aditya's condition?

Ans. Aditya most probably had developed some sort of allergy due to pollens of grasses, trees and other plants.

Q 2. How can allergy be diagnosed in a person?

Ans. Allergies mainly involve IgE antibodies and chemicals like histamine and serotonin from mast cells.

OR

Write the consequence of the symptoms which Aditya developed on account of being allergic?

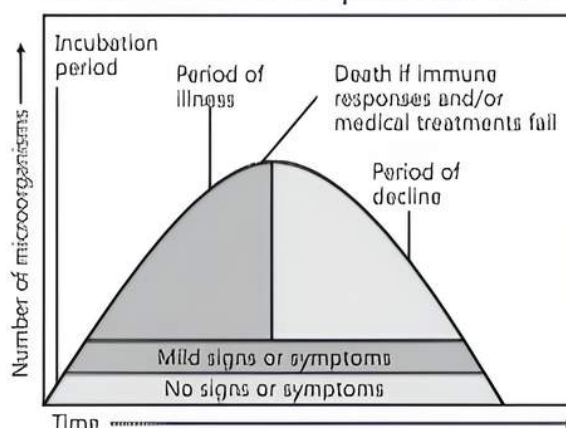
Ans. The allergy which Aditya developed is characterised by inflammation of membrane lining the nose and conjunctiva leading to running nose, watering eyes and constant sneezing.

Q 3. Name the type of allergy that Aditya developed.

Ans. Hay fever.

Case Study 5

When a microorganism invades a host, a definite sequence of events usually occur leading to infection and disease, causing suffering to the host. This process is called pathogenesis. Once a microorganism overcomes the defense system of the host, development of the disease follows a certain sequence of events as shown in the graph. Study the graph given below for the sequence of events leading to appearance of a disease and answer the questions that follow:



Read the given passage carefully and give the answer of the questions that follows:

Q 1. In which period, according to the graph there are maximum chances of a person transmitting a disease/infection and why?

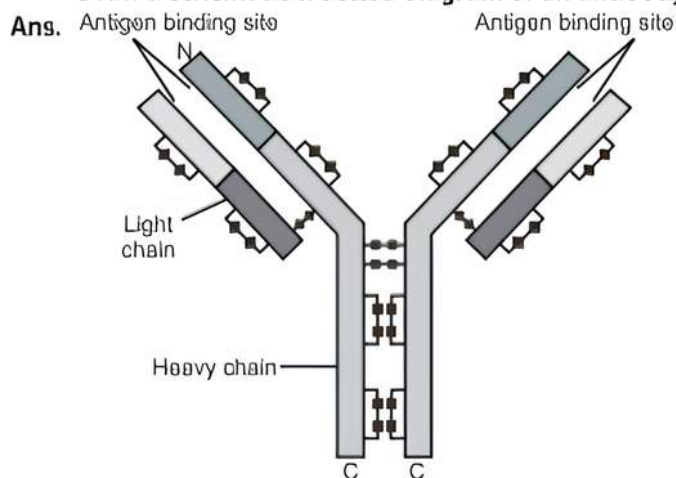
Ans. Period of illness. It is because the number of disease causing microorganisms reaches maximum in the period of illness.

Q 2. Study the graph and write what is an incubation period. Name a sexually transmitted disease that can be easily transmitted during this period. Name the specific type of lymphocytes that are attacked by the pathogen of this disease.

Ans. The time between no signs and symptoms till mild signs and symptoms is called Incubation period. AIDS is the sexually transmitted disease that can spread in this period. Macrophages are specific type of lymphocytes that are attacked by the pathogen of this disease.

OR

Draw a schematic labelled diagram of an antibody.



Structure of an antibody molecule

Q 3. In which period, the number of immune cells forming antibodies will be the highest in a person suffering from pneumonia?

Name the immune cells that produce antibodies.

Ans. The number of immune cells will be the highest during the period of illness. B-lymphocytes produce antibodies.



Very Short Answer Type Questions

Q 1. Name two diseases whose spread can be controlled by the eradication of *Aedes* mosquitoes. (CBSE 2018)

Ans. Dengue, Chikungunya / Yellow Fever / Eastern Equine Encephalitis / West Nile Fever / Zika / Zika Virus Disease (Any two)

Q 2. Malaria, typhoid, pneumonia and amoebiasis are some of the human infectious diseases. Which ones of these are transmitted through mechanical carriers?

Ans. Malaria and amoebiasis are transmitted through mechanical carriers.



TIP

Transmission method of all diseases must be remembered as method of infection is directly related with the disease early symptoms.

Q 3. Name the two intermediate hosts which the human liver fluke depends on to complete its life cycle so as to facilitate parasitisation of its primary host.

Ans. Snail and Fish are the two intermediate hosts.

Q 4. Why is *Gambusia* introduced into drains and ponds?

Ans. *Gambusia* is introduced into drains and ponds to feed on mosquito larvae so as to eliminate the vectors responsible for causing malaria.

Q 5. How does haemozoin affect the human body when released in blood during malarial infection?

Ans. Haemozoin is responsible for the chill and high fever recurring every three to four days during malarial infection.

Q 6. A boy of ten years had chicken pox. He is not expected to have the same disease for the rest of his life. Mention how it is possible.

Ans. The boy when encounters a pathogen for the first time, his body produces antibodies that results in the memory of the first encounter, to protect the body in future.

Q 7. How do cytokine barriers provide Innate immunity in humans? (CBSE 2018)

Ans. Interferon (proteins), secreted by virus infected cells protect non-infected cells from further viral infection.

Q 8. Why is secondary immune response more intense than the primary immune response in humans?

Ans. This is because of presence of antibodies developed during primary immune response in humans.

Q 9. Name any two types of cells which act as 'Cellular Barriers' to provide innate immunity in humans.

Ans. Polymorphonuclear leukocytes / neutrophils / monocyte, natural killer (type of lymphocyte), macrophages.

Q 10. When does a human body elicit an anamnestic response?

Ans. A human body elicits an anamnestic response at the time of secondary response.

Q 11. What is an autoimmune disease? Give an example.

Ans. An autoimmune disease is an abnormal immune response in which the immune system of the body starts rejecting its own body cells or 'self' cells and molecules, e.g., rheumatoid arthritis.

Q 12. What is it that prevents a child to suffer from a disease he/she is vaccinated against? Give one reason. (CBSE 2019)

Ans. The immunological memory induced by the vaccine in a child prevents the recurrence of a disease.

Q 13. Name the category of the disease Rheumatoid arthritis.

Ans. Rheumatoid arthritis is an auto-immune disease.

Q 14. State two different roles of spleen in the human body.

Ans. Spleen is the secondary lymphoid organ that stores lymphocytes, it filters microbes and acts as a reservoir to store erythrocytes.

Q 15. Why do pollen grains of some flowers trigger 'sneezing' in some people? (CBSE 2019)

Ans. Pollen grains trigger sneezing by causing allergic reaction.



Q 16. Some allergens trigger sneezing and wheezing in human beings. What causes this type of response by the body?

Ans. The exaggerated response of the immune systems to certain antigens (allergens) present in the environment is the cause of this type of response.

Q 17. State the function of mast cells in allergy response.

Ans. Mast cells release chemicals like histamine and serotonin in allergic response.

Q 18. How do interferons protect us?

Ans. Interferons protect non-infected cells from further viral infections, by creating cytokine barriers.

Q 19. What type of virus causes AIDS? Name its genetic material.

Ans. Retrovirus causes AIDS. RNA is its genetic material.

Q 20. Name the type of cells the AIDS virus enters into after getting in the human body.

Ans. The AIDS virus enters into monocytes and helper T-lymphocytes.

Q 21. Name two STDs which can be transmitted through contaminated blood.

Ans. Hepatitis-B and AIDS are the two STDs which can be transmitted through contaminated blood.

Q 22. How does colostrum provide initial protection against diseases to new born infants? Give one reason.

Ans. Colostrum contains several antibodies which are absolutely essential for developing resistance in the new born babies.

Short Answer Questions

Q 1. Define the term 'health'. Mention any two ways of maintaining it.

Ans. Health is a state of complete physical, mental and social well-being. Good health is maintained by balanced diet/personal hygiene/regular exercise.

Q 2. Identify a, b, c and d in the following table:

S. No.	Name of the human disease	Name of the causal bacteria/virus	Specific organ or its part affected
(i)	Typhoid	<i>Salmonella typhi</i>	a
(ii)	Common cold	b	c
(iii)	Pneumonia	<i>Streptococcus pneumoniae</i>	d

Ans. a. small intestine
b. Rhinovirus
c. nose and respiratory passage
d. alveoli of lungs

Q 3. Name the causative organism of the disease amoebiasis. List three symptoms of the disease.

Ans. *Entamoeba histolytica* causes amoebiasis.
Symptoms are constipation, abdominal pain, cramps, stool with excess mucous/blood clots.

Q 4. Write the scientific names of the causal organisms of elephantiasis and ringworm in humans. Mention the body parts affected by them.

Ans.

Disease	Elephantiasis
Causal organism	<i>Wuchereria bancrofti</i> and <i>Wuchereria malayi</i>

Body parts affected	<u>Lymph vessels of lower limbs and genital organs.</u>
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Disease	Ringworm
Causal organism	<i>Microsporum</i> , <i>Trichophyton</i> and <i>Epidermophyton</i>

Body parts affected	<u>Skin, nails and scalp.</u>
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Q 5. List the symptoms of Ascariasis. How does a healthy person acquire this infection?

Ans. Symptoms of Ascariasis: Internal bleeding, muscular pain, anaemia, blockage of intestinal passage.
A healthy person can acquire this infection by intake of water, vegetables/fruits/foods contaminated with eggs of the parasite.

Q 6. Mention one application for each of the following:

- Passive immunisation
- Antihistamine
- Colostrum
- Cytokine-barrier

(CBSE 2017)

Ans. (i) **Passive Immunisation:** When readymade antibodies are introduced into the body. It is called as passive immunisation. It provides quick immune response in body.

(ii) **Antihistamines:** These are the chemicals which are given against allergic reactions.

(iii) **Colostrum:** It is the yellow fluid produced during the initial days of lactation. It is rich in antibodies and is necessary to develop resistance in a new born baby.

(iv) **Cytokine-Barrier:** It is Interferon which are the glycoproteins that protect non-infected cells from further viral infection.

Q 7. Humans have innate immunity for protection against pathogens that may enter the gut along with food. What are the two barriers that protect the body from such pathogens?

(CBSE SQP 2022, Term-2)

Ans. Microbial pathogens enter the gut of humans along with food:

- (i) **Physical Barriers:** Mucus coating of the epithelium lining the gastrointestinal tract helps in trapping microbes entering our body.
- (ii) **Physiological Barriers:** Acid in the stomach, saliva in the mouth prevent microbial growth.

Q 8. Differentiate between the roles of B-lymphocytes and T-lymphocytes in generating immune responses. (CBSE 2019)

Ans.

S.No.	Basis of difference	B-lymphocytes	T-lymphocytes
(i)	Location	They are born and also mature in bone marrow.	Originate in the bone marrow and mature in the thymus.
(ii)	Differentiation	B-lymphocyte differentiates into a plasma cell which secretes immunoglobulin.	T-cells multiply and differentiate into helper, regulatory, or cytotoxic T-cells or become memory T-cells.
(iii)	Immunity	B-cells are primarily responsible for humoral immunity (relating to antibodies).	T-cells are involved in cell-mediated immunity.

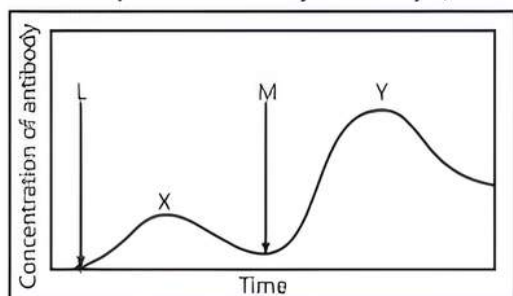
COMMON ERROR

Most students explain this difference incorrect or do not present it in tabular form.

Q 9. Principle of vaccination is based on the property of memory of the immune system. Taking one suitable example, justify the statement. (CBSE 2019)

Ans. The principle of vaccination is based on the property of 'memory' of the immune system. In vaccination, a preparation of antigenic proteins of the pathogen or attenuated (inactivated/weakened) pathogen is introduced in the body. The antibodies produced in the body against these pathogens will neutralize the pathogenic agents during actual infection. The vaccine also generates memory B-cells and T-cells that recognise the pathogen quickly on subsequent exposure. For example, vaccination against polio prevents the actual pathogen from resulting in infection.

Q 10. The graph given below indicates the administration of the first (L) and second dose (M) of a vaccine. The corresponding response of the body is indicated by X and Y. Interpret the graph and explain the reason for such a response shown by the body. (CBSE 2023)



Ans. On administration of the first dose of the vaccine (L), the body shows a response of **low intensity** (X) as the immune system comes in contact with the antigenic protein of the weakened/inactivated pathogen for the first time. This is called **primary immune response**. On subsequent encounter with the same antigenic protein in the second dose (M), the body elicits a **highly intensified** secondary response (Y). Because of the memory of the first contact with the antigen, the secondary immune response is **faster and stronger**, leading to more effective pathogen elimination in comparison to the primary immune response.

Q 11. Name the two primary lymphoid organs. State the importance of T-lymphocytes. (CBSE 2016)

Ans. The two primary lymphoid organs are: Thymus and Bone marrow.

Importance: It helps B-cells in production of antibodies/mediate CMI/responsible for graft rejection.

Q 12. From which plant are cannabinoids obtained? Name any two cannabinoids. Which part of the body is affected by consuming these substances?

OR Write the scientific name of the plant from where natural cannabinoids are obtained. (CBSE 2022, Term-2)

Ans. Cannabinoids are obtained from the inflorescence of the plant Cannabis sativa. Marijuana, hashish, charas, ganja are some cannabinoids. These chemicals interact with cannabinoid receptors of the body, mainly present in the brain. Cardiovascular system is affected adversely.

Q 13. Describe the role of lymph nodes in providing immunity.

Ans. Lymph nodes trap microorganisms or other antigens. These trapped antigens activate lymphocytes present in the lymph and cause an immune response.

Q 14. State the functions of primary and secondary lymphoid organs in humans.

Ans. Primary lymphoid organs are the sites where immature lymphocytes differentiate into antigen sensitive lymphocytes.

Secondary lymphoid organs are the sites where the lymphocytes interact with antigens and proliferate to become effector cells.

Q 15. Name any two techniques used to detect the cancer of internal organs and write about any one of them. (CBSE 2023)

Ans. Techniques such as radiotherapy and MRI (Magnetic Resonance Imaging) are useful to detect cancers of internal organs.

MRI is a medical imaging technique used in radiology to form pictures of the anatomy and physiological process of the body.

Q 16. Epithelial lining of our intestine is considered as secondary lymphoid organ. Justify the statements. (CBSE 2022, Term-2)

Ans. Epithelial lining of our intestine has Peyer's patches, located in the lamina propria of the mucosa and extending into the submucosa of the ileum. They



provide sites for interaction of lymphocytes, with the antigen, which then proliferate to become effector cells.

- Q 17. (i) Name the lymphoid organ in humans where all the blood cells are produced.
(ii) Where do the lymphocytes produced by the lymphoid organ mentioned above migrate and how do they affect immunity?

Ans. (i) All the blood cells are produced in bone marrow.
(ii) The lymphocytes produced migrate to secondary lymphoid organs like spleen, lymph nodes, etc. They trap the microorganisms thereby activating the lymphocytes present in the lymph nodes and produce an immune response.

- Q 18. (i) Highlight the role of thymus as a lymphoid organ.
(ii) Name the cells that are released from the above mentioned gland. Mention how they help in immunity.

Ans. (i) Immature lymphocytes differentiate into mature T-lymphocytes and become antigen sensitive in thymus.
(ii) T-lymphocytes are released from thymus. T-cells help B-cells to produce antibodies and provide cell-mediated immunity.

- Q 19. Explain the role of B and T lymphocytes in providing immunity to humans. (CBSE 2022, Term-2)

Ans. B-lymphocytes, also called B cells, create a type of protein called an antibody.
T-cells can wipe out infected or cancerous cells. They also direct the immune response by helping B lymphocytes to eliminate invading pathogens.

- Q 20. (i) Give an example of a genus of virus used as narrow spectrum insecticidal biocontrol agent.
(ii) How does its use serve as an aid in overall integrated pest management programme?

(CBSE 2023)

Ans. (i) Nucleopolyhedrovirus
(ii) Baculoviruses are the viruses that attack the arthropods/insects. These viruses are excellent species specific effective narrow spectrum. Insecticidal biocontrol agent.

- Q 21. Why a malignant tumour considered to be more damaging than a benign tumour? Explain.

(CBSE 2023)

Ans. Tumours are the cellular mass that develop inside the body due to accumulation of cells or their over growth. These are divided into categories of benign and malignant tumours. Benign tumours are less harmful as compared to malignant tumours. It is because, malignant tumours have malignant property i.e., the cells of malignant tumours can detach from their main site and spread in other

parts of the body. Thus, malignant tumours spread easily in the body. This leads to chances of cancer spread in the patient with malignant tumours.

- Q 22. How are malignant tumors different from benign tumors? Why are many patients treated with α interferon? (CBSE 2020)

Ans. Benign tumors remain confined to their original location/ do not spread to other parts of the body/ cause little damage/no metastasis.
Malignant tumors proliferate and spread to other body parts/is more harmful/cause serious damage thus causing metastasis.
Many patients are treated with α -interferons which are biological response modifiers that activate immune system to destroy tumor.

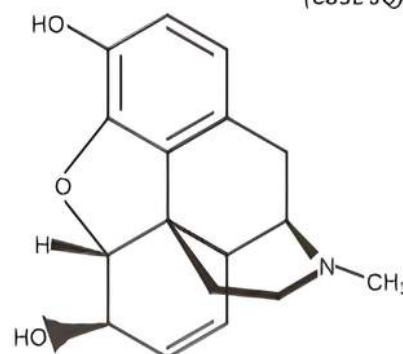
- Q 23. (i) Name the source plant of heroin drug. How is it obtained from the plant? (CBSE 2018)

(ii) Write the effects of heroin on the human body.

Ans. (i) The source plant of heroin drug is Popover somniferum/poppy plant.
It is extracted from latex of the plant / acetylation of morphine (obtained from the latex of plant).
(ii) Heroin acts as a depressant, and slows down body function.

- Q 24. Identify the compound chemical structure is shown below. State any three of its physical properties.

(CBSE SQP 2022, Term-2)



Ans. (i) It is morphine.
(ii) Physically it appears as a white, odourless, crystalline compound.

- Q 25. Name the plant source of cocaine. How does it affect the human body?

OR

Name the drug obtained from *Erythroxylum coca* and write its effects on the human body.

Ans. Plant source of cocaine is *Erythroxylum coca*. It has a potent stimulating action on central nervous system, producing a sense of euphoria and increased energy.
Excessive dosage of cocaine causes hallucinations.



TiP

Learn the scientific names of plant sources properly with that correct.



Long Answer Type-I Questions

Q 1. Name a human disease, its causal organism, symptoms (any three) and vector, spread by intake of water and food contaminated by human faecal matter. (CBSE 2017)

Ans. The human disease is amoebic dysentery (Amoebiasis)

(i) **Causal Organism:** Entamoeba histolytica, a Protozoa.

(ii) **Symptoms:** (a) Abdominal pain
(b) Constipation (c) Cramps.

(iii) **Vector:** Housefly.

Q 2. (i) Name the causative agent of typhoid in humans.
(ii) Name the test administered to confirm the disease.
(iii) How does the pathogen gain entry into the human body?

Write the diagnostic symptoms and mention the body organ that gets affected in severe cases.

OR

Name the bacterium that causes typhoid. Mention two diagnostic symptoms. How is this disease transmitted to others?

Ans. (i) Typhoid is caused by pathogenic bacterium Salmonella typhi.

(ii) Typhoid fever can be confirmed by Widal test.

(iii) Typhoid spreads by contaminated food and water. It generally enters the small intestine and then migrates to other organs through blood.

The diagnostic symptoms are:

(a) Constant high fever (39°C to 40°C)

(b) Weakness

(c) Stomach pain

(d) Loss of appetite

(e) Constipation

(f) Headache

Intestinal perforation occurs and death may occur in severe cases.

Q 3. Mention the name of the causal organism, symptoms and the mode of transmission of the disease amoebiasis.

OR

(i) Name the protozoan parasite that causes amoebic dysentery in humans.

(ii) Mention two diagnostic symptoms of the disease.

(iii) How is this disease transmitted to others?

OR

(i) Name the agent that causes amoebiasis and the human body organ that it infects.

(ii) Write the symptoms and the mode of transmission of the disease.

Ans. (i) Amoebic dysentery (Amoebiasis) is caused by an intestinal endoparasite, Entamoeba histolytica, found in large intestine of humans.

(ii) The diagnostic are:

(a) Abdominal pain

(b) Constipation

(c) Cramps

(d) Stool with excess mucous and blood clots.

(iii) Housefly acts as mechanical carrier and transmits the parasite from faeces of infected person to the food.

Infection takes place through contaminated food and water.

COMMON ERROR

Many students write improper symptoms and causal organism for the disease.

Q 4. A person is suffering from a high-grade fever. Which symptoms will help to identify if he/she is suffering from typhoid, pneumonia or malaria?

(CBSE SQP 2022, Term-2)

Ans. If the person has sustained high fever (39° to 40° C), weakness, stomach pain, constipation, headache and loss of appetite, it is typhoid.

If the person has fever, chills, cough and headache; and the lips and fingernails turn gray to bluish, it is pneumonia.

If the person has chills and high fever recurring every three to four days then, it is malaria.

Q 5. A farmer while working on his farm was bitten by a poisonous snake. The workers in the farm immediately rushed him to the nearby health centre. The doctor right away gave him an injection to save his life. What did the doctor inject and why? Explain.

Ans. The doctor injected an antivenom. The antivenom contains preformed antibodies which when injected act on the pathogen immediately and provide protection by providing passive immunity.

Q 6. On a visit to a Hill station, one of your friends suddenly become unwell and felt uneasy.

(i) List two symptoms you would look for the term it to be due to allergy.

(ii) Explain the response of the body to an allergen.

(iii) Name two drugs that can be recommended for immediate relief.

Ans. (i) Sneezing, watery eyes, running nose and difficulty in breathing are symptoms of allergy. (Any two)

(ii) In response to an allergen, the body releases antibodies of IgE type.

(iii) Antihistamine, adrenalin, steroids can be recommended for immediate relief.

Q 7. During a school trip to 'Rohtang Pass', one of your classmate suddenly developed 'altitude sickness'. But, she recovered after sometime.

(i) Mention one symptom to diagnose the sickness.

(ii) What caused the sickness?

(iii) How could she recover by herself after sometime?

- Ans. (i) Nausea/fatigue/heart palpitation.
 (ii) The sickness was caused due to low atmospheric pressure at high altitude because of which the body was deprived of oxygen.
 (iii) The body compensates low oxygen availability by increasing RBC production, decreasing the binding capacity of haemoglobin and by increasing breathing rate.

Q 8. A heavily bleeding bruised road accident victim was brought to a nursing home. The doctor immediately gave him an injection to protect him against a deadly disease.

- (i) Write what the doctor injected into the patient's body.
 (ii) How do you think this injection would protect the patient against the disease?
 (iii) Name the disease against which this injection was given and the kind of immunity it provides?

(CBSE 2016)

- Ans. (i) The doctor injected into the patient's body tetanus antitoxins/tetanus toxoid.
 (ii) The preformed antibody injected act on the pathogen immediately to provide protection.
 (iii) This injection was given against tetanus and it provides passive immunity.

Q 9. A person has been diagnosed to be HIV(+ve).

- (i) Name the disease and the test which the person has to undergo.
 (ii) Write the full name of the pathogen involved and describe its structure.
 (iii) Which particular cells of this person are likely to get destroyed?

(CBSE 2017)

OR

The immune system of a person is suppressed. In the ELISA test, he was found positive to a pathogen.

- (i) Name the disease the patient is suffering from.
 (ii) What is the causative organism?
 (iii) Which cells of the body are affected by the pathogen?

- Ans. (i) Name of the disease is AIDS and the test is ELISA – Enzyme Linked Immuno-Sorbent Assay.
 (ii) The pathogen involved is human Immunodeficiency Virus. Structure of HIV:
 (a) It has an envelope enclosing the genetic material which is single stranded RNA.
 (b) The envelope has spikes with receptors capable of recognising antigen receptors found on helper T-cells.
 (iii) It affects/destroys helper T-cells.

Q 10. How do normal cells get transformed into cancerous neoplastic cells? Elaborate giving three examples of inducing agent. (CBSE SQP 2022, Term-2)

Ans. Transformation of normal cells into cancerous neoplastic cells may be induced by following physical, chemical or biological agents causing DNA damage:

- (i) Ionising radiations like X-rays and gamma rays.
 (ii) Non-ionising radiations like UV.
 (iii) Chemical carcinogens present in tobacco smoke.
 (iv) Cellular oncogenes (c-onc) or proto-oncogenes. when activated under certain conditions cause cancer. Viruses with oncogenes can transform normal cells to cancerous cells.

Q 11. Recognition of an antigenic protein of a pathogen or exposure to a pathogen occurs during many types of immune responses, including active immunity and induced active immunity. Specify the types of responses elicited when human beings get encountered by a pathogen.

(CBSE SQP 2022, Term-2)

- Ans. (i) When our body encounters an antigenic protein or a pathogen for the first time it produces a response which is of low intensity and our body retains memory of the first encounter.
 (ii) The subsequent encounter with the same pathogen elicits a highly intensified response carried out with the help of two special types of lymphocytes present in our blood. B-lymphocytes and T-lymphocytes.
 (iii) The B-lymphocytes produce an army of proteins in response to these pathogens into our blood to fight with them. These proteins are called antibodies. The T-cells themselves do not secrete antibodies but help B-cells to produce them.

Q 12. How is a malignant tumor different from a benign tumor?

Ans.

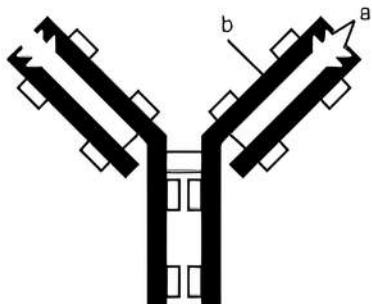
S. No.	Basis of difference	Benign tumor	Malignant tumor
(i)	Type	It is a <u>non-cancerous tumor.</u>	It is a <u>cancerous tumor.</u>
(ii)	Invasion	Benign tumor <u>does not show metastasis and is non-invasive.</u>	It <u>shows metastasis and thus invades other body parts.</u>
(iii)	Growth	It <u>stops growth after reaching a certain size.</u>	Malignant tumor <u>shows indefinite growth.</u>
(iv)	Adherence	Limited adherence occurs amongst cells of benign tumor.	There is no adherence amongst cells. They tend to slip past one another.
(v)	Fatality	It is <u>less fatal to the body.</u>	It is <u>more fatal to the body.</u>



COMMON ERROR

Differences must be written in tabular form as it is easy for the examiner to understand the answer.

- Q 13. (i) What does the given diagram illustrate?
 (ii) Name the parts labelled 'a' and 'b'.
 (iii) Name the type of cells that produce this molecule.



- Ans. (i) The given diagram illustrates an antibody molecule
 (ii) (a) Antigen binding site. (b) Heavy chain
 (iii) B-lymphocytes (B-cells) produce this molecule.

- Q 14. Name the cells HIV (Human Immunodeficiency Virus) gains entry into after infecting the human body. Explain the events that occur in these cells.

Ans. HIV virus gains entry into Macrophages and (Helper) T-lymphocytes after getting into the human body.

Events that occur in the cells are:

- Viral RNA forms DNA by reverse transcription using the enzymes reverse transcriptase and directs the infected cells to produce viral particles.
- Macrophages continue to produce viral particles and function as HIV factories.
- The viral particles simultaneously enter into helper T-lymphocytes, replicate and produce viral progenies.
- The number of T-lymphocytes progressively decreases in the body of the infected person.
- During this, person suffers from bouts of fever, weight loss etc. Also, decrease in the number of cells leads to weakening of immune system.

- Q 15. (i) Write the complete name of the diagnostic test for AIDS. Explain the principle it works on.
 (ii) Name the type of genetic material present in AIDS causing pathogen. (CBSE 2022, Term-2)

- Ans. (i) A widely used diagnostic test for AIDS is Enzyme Linked Immuno-Sorbent Assay (ELISA). ELISA works on the principle that specific antibodies bind the target antigen and detect the presence and quantity of antigens binding.
 (ii) Human Immunodeficiency Virus (HIV) is the causal organism of AIDS. It is a retrovirus belonging to the family of Retroviridae. The core of HIV contains two molecules of single stranded RNA as genetic material.

- Q 16. Medically it is advised to all young mothers that **breastfeeding is the best for their new born babies.** Do you agree? Give reasons in support of your answer. (CBSE 2016, 19)

Ans. Yes, I do agree with the fact that breastfeeding is the best for new born babies.

- Mammary glands start producing milk at the end of pregnancy. Milk produced during the initial few days of lactation is called colostrum which contains several antibodies.
- It helps in developing resistance for new born baby. It helps the baby fight off viruses and bacteria. Thus, breast milk is packed with disease fighting substance that protects from illness.

- Q 17. (i) Why is there a fear amongst the guardians that their adolescent wards may get trapped in drug/alcohol abuse? (CBSE 2017)

- (ii) Explain 'addiction' and 'dependence' in respect of drug/alcohol abuse in youth.

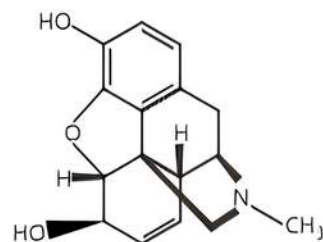
- Ans. (i) Reasons for alcohol abuse in adolescents:
 (a) Social pressure.
 (b) Curiosity and need for adventure, excitement and experiment.
 (c) To escape from stress, depression and frustration.
 (d) To overcome hardships of life.
 (e) Unstable or unsupportive family structure.
 (ii) **Addiction:** The psychological attachment to certain effects such as euphoria and a temporary feeling of well-being, associated with drugs and alcohol is called addiction.
Dependence: The tendency of the body to manifest a characteristic and unpleasant withdrawal syndrome on abrupt discontinuation of regular dose of drug/alcohol is called dependence.

- Q 18. Prior to a sports event, blood and urine samples of sports persons are collected for drug tests.

- Why is there a need to conduct such tests?
- Name the drugs the authorities usually look for.
- Write the genetic names of two plants from which these drugs are obtained. (CBSE 2015)

- Ans. (i) Such tests are conducted to detect drug abuse to ensure fair game.
 (ii) The authorities look for cannabinoids, cocaine, coca alkaloid, coke, crack, hashish, charas, ganja and hemp plant extract.
 (iii) These drugs are obtained from Cannabis, Atropa, Erythroxylum, Datura.

Q 19.



- (i) Name the category of drugs represented by the given chemical structure.
- (ii) If the methyl group is substituted by acetyl group we get a bitter crystalline compound. Name the compound.
- (iii) Name the natural source of these compounds.
- (iv) State the harmful effects of this class of drugs on the human body. (CBSE 2023)

- Ans. (i) Morphine.
- (ii) Heroin commonly called smack is a white, odourless, bitter crystalline compound and is obtained by acetylation of morphine.
 - (iii) Morphine is extracted from the latex of poppy plant (*Papaver somniferum*).
 - (iv) Heroin and such class of drugs is a depressant and slows down body functions.

Q 20. A team of students is preparing to participate in the interschool sports meet. During a practice session, you find some vials with labels of certain cannabinoids.

- (i) Will you report to the authorities? Why?
- (ii) Name a plant from which such chemicals are obtained.
- (iii) Write the effect of these chemicals on human body. (CBSE 2017)

- Ans. (i) Yes, because these may be abused by sports person.
- (ii) Such chemicals are obtained from *Cannabis sativa*.
 - (iii) These chemicals affect cardiovascular system of the body.

Q 21. Tobacco smoking, chewing or snuffing is very injurious to health of humans. Justify.

Ans. Tobacco contains nicotine. It stimulates the adrenal gland to release adrenaline and noradrenaline, which raises blood pressure and increases heart rate. This results in increased incidence of cancer of lungs, urinary bladder and throat, bronchitis/emphysema/ coronary heart disease/ gastric ulcer etc. It also increases carbon monoxide content in blood and reduces concentration of haemoglobin oxygen.



Long Answer Type-II Questions

Q 1. Describe the asexual and sexual phases of life cycle of *Plasmodium* that causes malaria in humans.

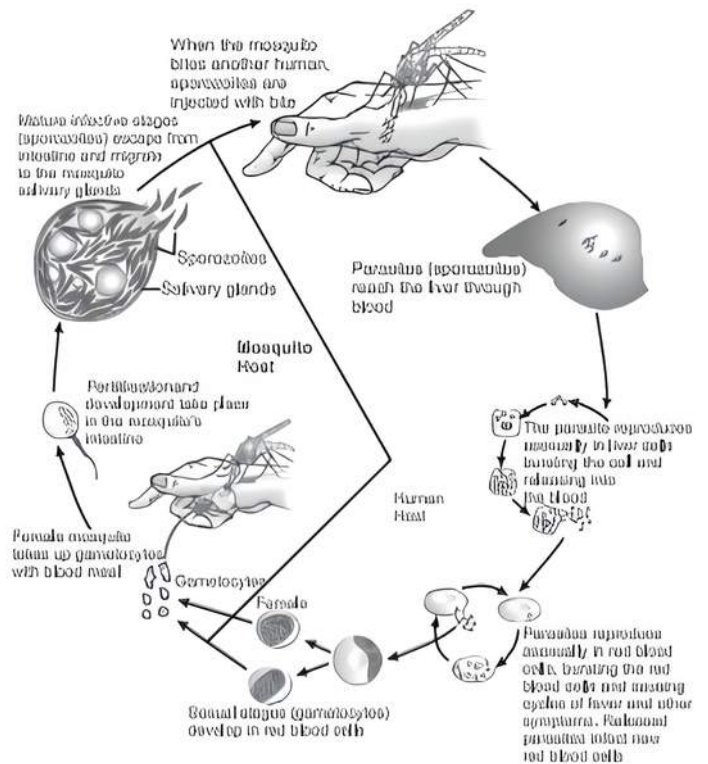
OR

Plasmodium protozoan needs both a mosquito and a human host for its continuity. Explain.

(CBSE 2023)

Ans. **Life cycle of *Plasmodium***

- (i) *Plasmodium* requires two hosts to complete its life cycle—human and mosquito.
- (ii) The infected female *Anopheles* mosquito transfers the infectious form of *Plasmodium*, i.e., sporozoites to the human body by biting.



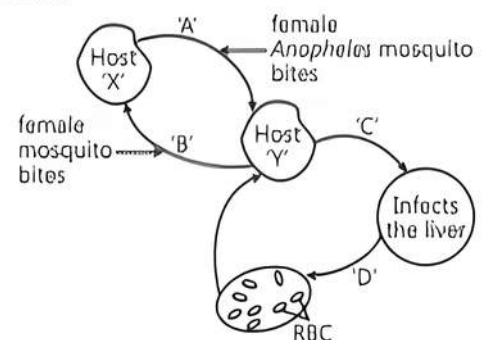
- (iii) The sporozoites reach the liver cells, where they multiply.
- (iv) This is followed by their attack on red blood cells resulting in their rupture.
- (v) The ruptured RBCs release a toxin called haemozoin, which is responsible for high recurring fever, chills and shivering.
- (vi) These parasites enter the female *Anopheles* mosquitoes when they bite an infected person. In the body of mosquitoes, they fertilise and multiply in the stomach wall.
- (vii) Sporozoites are now stored in the salivary gland of mosquito till it is again transferred to human body by a mosquito bite. After entering the human body, all the events are repeated.



TIP

Practice writing answers in pointer form rather than in the form of an essay or a paragraph.

Q 2. The diagram shows the life cycle of a pathogenic Protozoan.



- (i) Name the parasitic stage that is being transferred from host 'X' to host 'Y'.
- (ii) Write the changes that the parasite undergoes in the liver.

- (iii) Write the changes the parasite undergoes when it enters the RBC.
- (iv) Trace the changes the parasite undergoes when the host 'X' takes its blood meal from infected host 'Y'.

Ans. (i) Infective stage
 (ii) The parasites reach the liver through blood and starts multiplying within the liver cells.
 (iii) When the parasites enter the RBC, they rupture the red blood cells.
 (iv) Formation of gametes and fertilisation takes place in the intestine of mosquito.

OR

At which stage during the life cycle of the pathogen does the host 'Y' experience the symptoms of the disease? Name the disease and the toxic substance responsible for these symptoms. (CBSE 2023)

Ans. When the parasites rupture the red blood cells, they release a toxic substance called haemozoin responsible for chill and high fever recurring every 3 to 4 hours.

Q 3. Under polio prevention programme, Infants in India were given polio vaccines on a large scale at regular intervals to eradicate polio from the country.

- (i) What is vaccination? Explain how it imparts immunity to the child against the disease.
 (ii) With the help of an example each, differentiate between active and passive immunity.

(CBSE 2015)

Ans. (i) (a) Vaccination is the process of introduction of weakened or inactivated pathogens or proteins (vaccine) into a person to provide protection against a disease.
 (b) Vaccination provides immunisation after a time gap.
 (c) The vaccine generates memory B- and T-cells that recognise the pathogen on subsequent exposure and produce an intense immune response.

(ii) Difference between active and passive immunity

S. No.	Basis of difference	Active Immunity	Passive immunity
(i)	Development	It is developed due to contact with pathogen (dead or living) or its antigen, that leads to production of antibodies in the host body.	It is developed when readymade antibodies are injected into the body.
(ii)	Side effect	It has no or only few side effects.	It may cause a reaction.
(iii)	Process time	It is slow but long lasting.	It is fast but lasts only for few days.

(iv)	Response time	It takes time to develop its response.	It is used when the immune response has to be faster.
(v)	Example	For example, vaccination for polio, etc.	For example, administration of tetanus antitoxins, antibodies in colostrum etc.

COMMON ERROR

Usually students get confused between both types of immunity.

Q 4. Explain the process of replication of a retrovirus after it gains entry into the human body.

OR

- (i) How does a Human Immunodeficiency Virus (HIV) replicate in a host?
 (ii) How does a HIV-infected patient lose immunity?
 (iii) List any two symptoms of this disease.

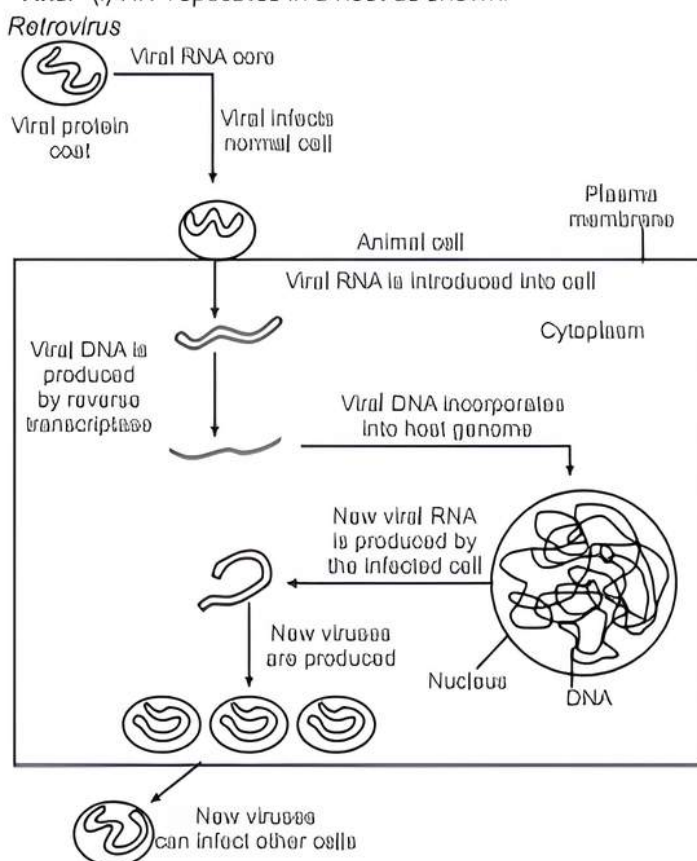
(CBSE 2016)

OR

With the help of a flow chart illustrate how an infected animal cell can survive while viruses are being replicated or released.

(CBSE SQP 2023-24)

Ans. (i) HIV replicates in a host as shown:



- (ii) An HIV-infected patient loses immunity due to loss of T-lymphocytes.
 (iii) Symptoms are fever, diarrhoea, susceptibility to other diseases and prone to microbial infection.

Q 5. Name and explain any four lymphoid organs present in humans.

OR

Explain the role of primary and secondary lymphoid organs with the help of suitable examples.

(CBSE SQP 2023-24)

Ans. (i) **Primary lymphoid organs:** The organs where lymphocytes originate and mature to become antigen-sensitive, e.g., bone marrow and thymus, are called primary lymphoid organs.

(a) **Bone marrow**

- It is the primary lymphoid organ where all blood cells including lymphocytes originate.
- Bone marrow provides the micro-environment for the development and maturation of B-lymphocytes.

(b) **Thymus**

- Thymus is a lobed organ located near the heart and beneath the breastbone.
- It is quite large at the time of birth but reduces with age.
- It provides the micro-environment for the development and maturation of T-lymphocytes.

(ii) **Secondary lymphoid organs:** The organs where lymphocytes interact with the antigen and proliferate to become effector cells, e.g., spleen, lymph nodes, tonsils, Peyer's patches of small intestine and appendix are called secondary lymphoid organs.

(a) **Spleen**

- It is a large bean-shaped organ and contains lymphocytes and phagocytes.
- It acts as a filter of the blood by trapping blood-borne microorganisms. It has a large reservoir of erythrocytes.

(b) **Lymph nodes**

- These are small solid structures present at different points along the lymphatic system.
- They trap the microorganisms or other antigens that enter the lymph and tissue fluid.

- Antigen trapped in the lymph nodes activate the lymphocytes and produce an immune response.

(c) **Mucosal Associated Lymphoid Tissue (MALT)**

- It is formed of masses of lymphoid tissue lining the mucosa of respiratory, digestive and urinogenital tracts.
- 50% of the lymphoid tissue in human body is formed by MALT.

COMMON ERROR

The students always get confused in differentiating between primary and secondary lymphoid organs.

Q 6. Why do some adolescents start taking drugs? How can the situation be avoided?

Ans. **Reasons for alcohol abuse in adolescents:**

- Social pressure.
- Curiosity and need for adventure, excitement and experiment.
- To escape from stress, depression and frustration.
- To overcome hardships of daily life.
- Unstable or unsupportive family structure.

The situation can be avoided using the following measures:

- Avoid undue peer pressure.
- Educating and counseling the problems and stresses to avoid disappointments and failures in life.
- Seeking help from parents and peers.
- Looking for danger signs to take appropriate measures on time.
- Seeking professional and medical help whenever required.



TIP

Distinctly learn the measures to avoid the taking of drugs and do not repeat in different words.



Chapter Test

Multiple Choice Questions

Q 1. AIDS is caused by HIV. Among the following, which one is not a mode of transmission of HIV?

- Transfusion of contaminated blood.
- Sharing the infected needles.
- Shaking hands with infected persons.
- Sexual contact with infected persons.

Q 2. is a CNS stimulant as it interferes with the transport of the neuro-transmitter.....

- Cocaine, acetylcholine
- Barbiturate, glutamate
- Cocaine, dopamine
- Barbiturate, glycine

Q 3. Which of the following plants possess hallucinogenic properties?

- Erythroxylum coca
- Atrapa belladonna
- Datura stramonium
- All of these

Assertion and Reason Type Questions

Directions (Q.Nos. 4-5): Each of the following questions consists of two statements, one is Assertion (A) and the other is Reason (R). Select the correct answer to these questions from the codes a, b, c and d as given below.

- Both Assertion and Reason are true and Reason is the correct explanation of Assertion.
- Both Assertion and Reason are true but Reason is not the correct explanation of Assertion.
- Assertion is true but Reason is false.
- Both Assertion and Reason are false.



Q 4. Assertion (A): Subsequent encounter with the same pathogen elicits a highly intensified anamnestic response.

Reason (R): This is based on the fact that our body appears to have memory of the first encounter.

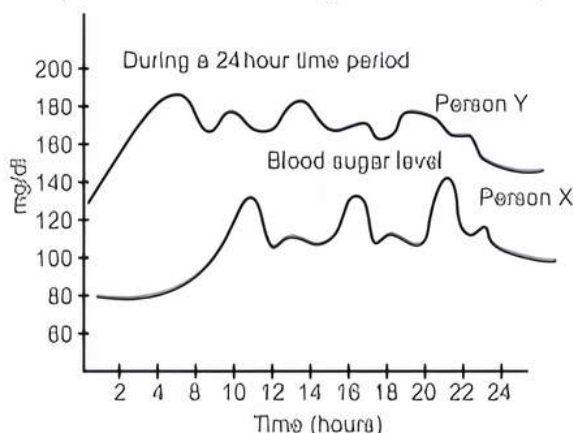
Q 5. Assertion (A): Proto-oncogenes are cellular genes required for normal growth.

Reason (R): Under normal conditions they could lead to the oncogenic transformation of the cell.

Case Based Questions

Case Study 1

Q 6. The given graph shows fluctuations in blood sugar of person X and Y during a 24-hour time period.



- (i) Which of the following holds true for person X?
- Person X is suffering from type I diabetes.
 - Person X shows severe insulin deficiency and beta cell depletion.
 - Person X is normal and shows good control of blood sugar level.
 - Person X is subjected to excessive urination and abnormal thirst.
- (ii) The given graph indicates that person Y is suffering from:
- diabetes
 - hypertension
 - atherosclerosis
 - rheumatic heart disease
- (iii) Which of the following conditions are common in person Y?
- Excretion of glucose in urine and excessive urination.
 - Polydipsia and mild beta cell depletion.
 - Progressive erosion of articular cartilage at synovial joint.
 - Both a. and b.
- (iv) A person suffering from diabetes mellitus becomes weak because:
- the cells are unable to utilise glucose and other carbohydrates for energy production.
 - degradation of fat increases production of toxic ketone bodies.

- cells utilise proteins for obtaining energy.
- All of the above

Case Study 2

Q 7. Antibodies are immunoglobulins (Igs) which are produced in response to antigenic stimulation and each antibody is a protein molecule. Antibodies are produced by B-lymphocytes. T-lymphocytes do not produce antibodies themselves but help B cells to produce them.

Each antibody molecule has four peptide chains, two small light chains and two longer heavy chains. Hence, the antibody is represented as H_2L_2 . Different types of antibodies such as IgA, IgM, IgD, IgE, IgG are produced in our body. IgG is the only antibody to cross placenta.

Read the given passage carefully and give the answer of the following questions:

- What are antibodies?
- Antibodies are produced by which lymphocytes?
- How many peptide chains are there in each antibody?

OR

Name any three antibodies which are produced by our body.

Very Short Answer Type Questions

- Q 8.** Why sharing of injection needles between two individuals are not recommended?
- Q 9.** Retroviruses have no DNA. However, the DNA of the infected host cell does possess viral DNA. How is it possible?
- Q 10.** Mention the useful as well as the harmful drug obtained from the latex of poppy plant.

Short Answer Type Questions

- Q 11.** What would happen to immune system, if thymus gland is removed from the body of a person?
- Q 12.** What is colostrum? Why is it important to be given to the new born infants?

Long Answer Type-I Question

- Q 13.** Answer the following questions:
- Name a drug used:
 - As an effective sedative and pain killer.
 - For helping patients to cope with mental illnesses like depression, but often misused.
 - How does the moderate and high dosage of cocaine affect the human body?

Long Answer Type-II Question

- Q 14.** Explain in detail the types and roles of antibodies.