Chapter 8
Human Health and Diseases

Important-Terms-

1. Congenital diseases- these are inborn diseases which are present by birth and inheritable.
2. Communicable or infectious diseases- which can be transmitted from infected person to healthy person
3. Non communicable or non infectious diseases- which cannot be transmitted
4. Contagious diseases- these are communicable diseases that can be spread from actual contact
5. Non- contagious diseases- these are communicable diseases that can spread with the help of any agency.
6. Transplacental transmission- virus of germen measles and AIDS and bacteria of Syphilis can be transmitted through placenta.
7. Vector born diseases- malaria-anopheles mosquitoes, dengue- adese mosquitoes and cholera- housefly
8. Vehicle borne diseases- Cholera, dysentery, typhoid are transmitted by agencies like food, water etc.
9. Epidemiology- Means of spread of disease or mode of transmission
10. Manifestation- disease symptoms
11. Prophylaxis- prevention of disease
12. Analgesics- Drugs that reduces pain
13. Antipyretics- Drugs that quickly bring down the temperature
14. Antiretroviral drugs- That prevent the replication of viruses or block the process of reverse transcription e.g. Azidothymidine, Nevirapine, Lamivudine
15. Etiology- cause of disease
16. Schizogony-Phase of asexual multiplication occur in liver and RBCs repeatedly.
17. NMEP- National Malaria Eridication Programme
18. Haemozoin- Toxic substance formed from haemoglobin of RBCs when RBCs are destroyed by developing stages (merozoites) of the plasmodium.
19. Passive or artificial immunity- The readymade antibodies obtained from human and animal serum, who had already recovered from an infectious disease, are injected into human body to develop immunity.
20. IgG is selectively transported through the placenta to provide passive immunity.
21. Second generation vaccines-The vaccines produced by rDNA technology e.g. Hepatitis-B vaccine
22. Interferon –Certain animal cells infected by viruses produced polypeptides called Cytokines. One type of cytokine is interferon, diffuse to neighbouring cells and stimulates them to produce biochemical's that blocks viral replication.
23. Diapedesis-Neutrophils have the ability to come out of blood capillaries by amoeboid movement.
24. Macrophages-Large amoeboid phagocytic cells which are found in most of connective tissues (called Histiocytes) e.g. Microglia of CNS, Kupffer cells of liver etc.
25. Inflammatory response-The damaged cells release histamine which causes the inflammation. Leucocytes and macrophases always operate through inflammatory response and form second line of defence.
26. AMIS- Antibody Mediated Immune System or Humoral Immune System- It is formed of proteinous defensive chemicals, called antibodies produced by B-lymphocytes and circulates in the plasma of blood and lymph.
27. CMIS-Cell Mediated Immune System- It is formed of highly specialized cells, called T-lymphocytes which directly attack the pathogenic microbes.
28. Plasma cells-B-lymphocytes are stimulated by the antigens and synthesize RNA, divide rapidly and differentiate into RER-rich histologically distinctive Plasma cells. These plasma cells produce antibodies at the rate of 2000 molecules per second.
29. Lymphoblast-When a T-cell is stimulated by specific antigen, this immunologically competent T-lymphocyte divides rapidly to form a clone of T-cells, called lymphoblast.
30. Opsonization- Some antibodies coat the surface of the microbes and make them susceptible to phagocytosis. Such antibodies are known as opsonins.
31. Epitope- The part of antigen which corresponds to Paratope of the antibody
32. Paratope- The part of hypervariable regions on the antibody which binds the antigen is called Paratope.
33. MALT - Mucosa-Associated Lymphoid Tissue, in respiratory tract it is called BALT- Bronchial Associated Lymphoid Tissue, when associated with small intestine it is called GALT- Gut Associated Lymphoid Tissue e.g. Payer's patches
34. SCID- Severe Combined Immuno-Deficiency- Most serious congenital Immuno deficiency in children, so called primary Immuno-deficiency, It is caused by a recessive gene mutation which causes deficiency of enzyme Adenosine deaminase
35. NACO- National AIDS control organization, established in 1992 and headquarters New Delhi
36. ELISA- Enzyme Linked Immuno-sorbant Assay for the detection of AIDS and certain type of cancers
37. Metastasis- Process of the transference of cancerous cells from the site of origin to distant part of the body
38. Latent stage- The period in which HIV virus remain dormant in the body of patient and no symptom of the AIDS is observed.
39. Alpha-state theory- Abnormal growth, characteristic of cancerous cells, is a reversion to an evolutionary stage of growth, called α-state, where the cells may proliferate rather performing specific function.
40. Hypoxia- less or insufficient supply of oxygen to the body cells
41. LSD- Lysergic acid Diethylamide, derived from dried fruiting body called sclerotium of ergot fungus (Claviceps purpurea) parasite on the ovary of flowers of rye.
42. Withdrawal symptoms- These are behavioural and physiological disturbances which are exhibited by an addict if regular dose of alcohol/drug is abruptly discontinued.
43. Dopamine- It is neurotransmitter; its transport is hindered due to effect of nicotine, drugs and alcohol at the nerve endings
44. Opiate- Drugs derived from the extract of opium poppy e.g. morphine, heroin, brown sugar etc.
45. Cannabinoids- These are products of hemp plant called cannabis indica, e.g. bhang, charas, ganja
46. Mood elevators-Stimulants (caffeine, amphetamine and cocaine) increase the activity of CNS by stimulating release of nor-adrenalin, so act as mood elevators
47. Hallucination- seeing objects which are not present, this situation is generated by hallucinogens or psychedelic drugs e.g. LSD
48. WADA- World Anti Doping Agency
49. Sedative- They give a feeling of calmness, relaxation or drowsiness in the body. Their high doses induce sleep.
50. Tranquilizers- They slows down the higher centers of brain and relieve from worries but do not affect the working efficiency.

SIMILAR TERMS-
- Mood elevators-Stimulants
- AMIS - Antibody Mediated Immune System or Humoral Immune System
- Passive or artificial immunity
- Antibody-Immunoglobulin
- Etiology- cause of disease
- Epidemiology- Means of spread of disease or mode of transmission
- Manifestation- disease symptoms
- Prophylaxis- prevention of disease
- Non communicable or non infectious diseases
- Communicable or infectious diseases

Important Terms:

In later years, biology stated that mind influences, through neural system and endocrine system, our immune system and that our immune system maintains our health. Hence, mind and mental state can affect our health. Of course, health is affected by –

(i) Genetic disorders – deficiencies with which a child is born and deficiencies/defects which the child inherits from parents from birth;
(ii) Infections and
Life style including food and water we take, rest and exercise we give to our bodies, habits that we have or lack etc.

Health does not simply mean ‘absence of disease’ or ‘physical fitness’. It could be defined as a state of complete physical, mental and social well-being.

When people are healthy, they are more efficient at work. This increases productivity and brings economic prosperity. Health also increases longevity of people and reduces infant and maternal mortality.

Balanced diet, personal hygiene and regular exercise are very important to maintain good health. Yoga has been practiced since time immemorial to achieve physical and mental health. Awareness about diseases and their effect on different bodily functions, vaccination (immunization) against infectious diseases, proper disposal of wastes, control of vectors and maintenance of hygienic food and water resources are necessary for achieving good health.

Diseases can be broadly grouped into infectious and non-infectious. Diseases which are easily transmitted from one person to another are called infectious diseases. Infectious diseases are very common and every one of us suffers from these at sometime or other. Some of the infectious diseases like AIDS are fatal. Among non-infectious diseases, cancer is the major cause of death. Drug and alcohol abuse also affect our health adversely.

COMMON DISEASES IN HUMANS
A wide range of organisms belonging to bacteria, viruses, fungi, protozoans, helminths, etc., could cause diseases in man. Such disease causing organisms are called pathogens.

All parasites are therefore pathogens as they cause harm to the host by living in (or on) them. Pathogens have to adapt to life within the environment of the host. For example, the pathogens that enter the gut must know a way of surviving in the stomach at low pH and resisting the various digestive enzymes.

1. **Salmonella typhi** is a pathogenic bacterium which causes typhoid fever in human beings.
   - These pathogens generally enter the small intestine through food and water contaminated with them and migrates to other organs through blood.
   - Sustained high fever (39° to 40°C), weakness, stomach pain, constipation, headache and loss of appetite are some of the common symptoms of this disease. Intestinal perforation and death may occur in severe cases.
   - Typhoid fever could be confirmed by Widal test.
   - A classic case in medicine, that of Mary Mallon nicknamed **Typhoid Mary**, is worth mentioning here. She was a cook by profession and was a typhoid carrier who continued to spread typhoid for several years through the food she prepared.

2. Bacteria like **Streptococcus pneumoniae** and **Haemophilus influenzae** are responsible for the disease pneumonia in humans which infects the alveoli (air filled sacs) of the lungs.
   - As a result of the infection, the alveoli get filled with fluid leading to severe problems in respiration. The symptoms of pneumonia include fever, chills, cough and headache. In severe cases, the lips and finger nails may turn gray to bluish in colour.
   - 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.

3. **Rhino viruses** represent one such group of viruses which cause one of the most infectious human ailments – the common cold.
• They infect the nose and respiratory passage but not the lungs. The common cold is characterized by nasal congestion and discharge, sore throat, hoarseness, cough, headache, tiredness, etc., which usually last for 3-7 days.
• Droplets resulting from cough or sneezes of an infected person are either inhaled directly or transmitted through contaminated objects such as pens, books, cups, doorknobs, computer keyboard or mouse, etc., and cause infection in a healthy person.

4. Some of the human diseases are caused by protozoans too. Malaria, a disease man has been fighting since many years.
• Plasmodium, a tiny protozoan is responsible for this disease. Different species of Plasmodium (P. vivax, P. malaria and P. falciparum) are responsible for different types of malaria. Of these, malignant malaria caused by Plasmodium falciparum is the most serious one and can even be fatal.

Plasmodium enters the human body as sporozoites (infectious form) through the bite of infected female Anopheles mosquito. The parasites initially multiply within the liver cells and then attack the red blood cells (RBCs) resulting in their rupture. The rupture of RBCs is associated with release of a toxic substance, haemozoin, which is responsible for the chill and high fever recurring every three to four days.
When a female Anopheles mosquito bites an infected person, these parasites enter the mosquito’s body and undergo further development. The parasites multiply within them to form sporozoites that are stored in their salivary glands.
It is interesting to note that the malaria parasite requires two hosts – human and mosquitoes – to complete its life cycle; the female Anopheles mosquito is the vector (transmitting agent) too.

5. Entamoeba histolytica is a protozoan parasite in the large intestine of human which causes amoebiasis (amoebic dysentery).
• Symptoms of this disease include constipation, abdominal pain and cramps, stools with excess mucus and blood clots.
• Houseflies act as mechanical carriers and serve to transmit the parasite from faeces of infected person to food and food products, thereby contaminating them. Drinking water and food contaminated by the faecal matter are the main source of infection.

6. Ascaris, an intestinal parasite causes ascariasis.
• Symptoms of this disease include internal bleeding, muscular pain, fever, anemia and blockage of the intestinal passage.
• The eggs of the parasite are excreted along with the faeces of infected persons which contaminate soil, water, plants, etc.
• A healthy person acquires this infection through contaminated water, vegetables, fruits, etc.

7. Wuchereria (W. bancrofti and W. malayi), the filarial worms cause a slowly developing chronic inflammation of the organs in which they live for many years, usually the lymphatic vessels of the lower limbs and the disease is called elephantiasis or filariasis.
• The genital organs are also often affected, resulting in gross deformities. The pathogens are transmitted to a healthy person through the bite by the female mosquito vectors.

8. Microsporum, Trichophyton and Epidermophyton are responsible for ringworms which is one of the most common infectious diseases in man.
• Appearance of dry, scaly lesions on various parts of the body such as skin, nails and scalp are the main symptoms of the disease. These lesions are accompanied by intense itching. Heat and moisture help these fungi to grow, which makes them thrive in skin folds such as those in the groin or between the toes.
• Ringworms are generally acquired from soil or by using towels, clothes or even the comb of infected individuals.
Maintenance of personal and public hygiene is very important for prevention and control of many infectious diseases.

**Measures for personal hygiene** include keeping the body clean; consumption of clean drinking water, food, vegetables, fruits, etc.

**Public hygiene includes** proper disposal of waste and excreta; periodic cleaning and disinfection of water reservoirs, pools, cesspools and tanks and observing standard practices of hygiene in public catering.

- These measures are particularly essential where the infectious agents are transmitted through food and water such as typhoid, amoebiasis and ascariasis.

- In cases of air-borne diseases such as pneumonia and common cold, in addition to the above measures, close contact with the infected persons or their belongings should be avoided.

- For diseases such as malaria and filariasis that are transmitted through insect vectors, the most important measure is to control or eliminate the vectors and their breeding places. This can be achieved by 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.

- In addition, doors and windows should be provided with wire mesh to prevent the entry of mosquitoes. Such precautions have become all the more important especially in the light of recent widespread incidences of the vector-borne (*Aedes* mosquitoes) diseases like dengue and chikungunya in many parts of India.

**IMMUNITY**

Every day we are exposed to large number of infectious agents. However, only a few of these exposures result in disease. Why? This is due to the fact that the body is able to defend itself from most of these foreign agents. This overall ability of the host to fight the disease-causing organisms, conferred by the immune system is called immunity.

Immunity is of two types: (i) Innate immunity and (ii) Acquired immunity.

**Innate Immunity**

Innate immunity is non-specific type of defence that is present at the time of birth. This is accomplished by providing different types of barriers to the entry of the foreign agents into our body. Innate immunity consists of four types of barriers. These are —

(i) **Physical barriers**: Skin on our body is the main barrier which prevents entry of the micro-organisms. Mucus coating of the epithelium lining the respiratory, gastrointestinal and urogenital tracts also help in trapping microbes entering our body.

(ii) **Physiological barriers**: Acid in the stomach, saliva in the mouth, tears from eyes—all prevent microbial growth.

(iii) **Cellular barriers**: Certain types of leukocytes (WBC) of our body like polymorpho-nuclear leukocytes (PMNL-neutrophils) and monocytes and natural killer (type of lymphocytes) in the blood as well as macrophages in tissues can phagocytose and destroy microbes.

(iv) **Cytokine barriers**: Virus-infected cells secrete proteins called interferons which protect non-infected cells from further viral infection.

**Acquired Immunity**

Acquired immunity, on the other hand, is pathogen specific. It is characterized by memory. This means that our body when it encounters a pathogen for the first time produces a response called primary response which is of low intensity.

Subsequent encounter with the same pathogen elicits a highly intensified secondary or anamnestic response. This is ascribed to the fact that our body appears to have memory of the first encounter.
The primary and secondary immune responses are carried out with the help of two special types of lymphocytes present in our blood, i.e., B-lymphocytes and T lymphocytes.

The B-lymphocytes produce an army of proteins in response to 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 produce them.

Each antibody molecule has four peptide chains, two small called light chains and two longer called heavy chains. Hence, an antibody is represented as H2L2.

Different types of antibodies are produced in our body. IgA, IgM, IgE, IgG are some of them. Because these antibodies are found in the blood, the response is also called as humoral immune response. This is one of the two types of our acquired immune response – antibody mediated.

The second type is called cell-mediated immune response or cell-mediated immunity (CMI). Very often, when some human organs like heart, eye, liver, and kidney fail to function satisfactorily, transplantation is the only remedy to enable the patient to live a normal life. Then a search begins – to find a suitable donor.

Grafts from just any source – an animal, another primate, or any human beings cannot be made since the grafts would be rejected sooner or later.

Tissue matching, blood group matching are essential before undertaking any graft/transplant and even after this the patient has to take immunosuppressant all his/her life. The body is able to differentiate ‘self’ and ‘nonself’ and the cell-mediated immune response is responsible for the graft rejection.

Active and Passive 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.

Active immunity is slow and takes time to give its full effective response. Injecting the microbes deliberately during immunization or infectious organisms gaining access into body during natural infection induce active immunity.

When ready-made antibodies are directly given to protect the body against foreign agents, it is called passive immunity.

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. These are some examples of passive immunity.

Vaccination and Immunization

The principle of immunization or vaccination is based on the property of ‘memory’ of the immune system. In vaccination, a preparation of antigenic proteins of pathogen or inactivated/weakened pathogen (vaccine) is introduced into the body.

The antibodies produced in the body against these antigens would neutralize the pathogenic agents during actual infection. The vaccines also generate memory – B and T-cells that recognize the pathogen quickly on subsequent exposure and overwhelm the invaders with a massive production of antibodies.

If a person is infected with some deadly microbes to which quick immune response is required as in tetanus, we need to directly inject the preformed antibodies or antitoxin (a preparation containing antibodies to the toxin).

Even in cases of snakebites, the injection which is given to the patients, contain preformed antibodies against the snake venom. This type of immunization is called passive immunization.
Recombinant DNA technology has allowed the production of antigenic polypeptides of pathogen in bacteria or yeast. Vaccines produced using this approach allows large scale production and hence greater availability for immunization, e.g., hepatitis B vaccine produced from yeast.

**Allergies**

- The exaggerated response of the immune system to certain antigens present in the environment is called allergy. The substances to which such an immune response is produced are called allergens.
- The antibodies produced to these are of IgE type.
- Common examples of allergens are mites in dust, pollens, animal dander, etc.
- Symptoms of allergic reactions include sneezing, watery eyes, running nose and difficulty in breathing.
- Allergy is due to the release of chemicals like histamine and serotonin from the mast cells.
- For determining the cause of allergy, the patient is exposed to or injected with very small doses of possible allergens, and the reactions studied.
- The use of drugs like anti-histamine, adrenalin and steroids quickly reduce the symptoms of allergy.
- Somehow, modern-day life style has resulted in lowering of immunity and more sensitivity to allergens – more and more children in metro cities of India suffer from allergies and asthma due to sensitivity to the environment. This could be because of the protected environment provided early in life.

**Auto Immunity**

Memory-based acquired immunity evolved in higher vertebrates based on the ability to differentiate foreign organisms (e.g., pathogens) from self cells.

One, higher vertebrates can distinguish foreign molecules as well as foreign organisms. Most of the experimental immunology deals with this aspect.

Two, sometimes, due to genetic and other unknown reasons, the body attacks self-cells. This result in damage to the body and is called auto-immune disease. Rheumatoid arthritis which affects many people in our society is an auto-immune disease.

**Immune System in the Body**

The human immune system consists of lymphoid organs, tissues, cells and soluble molecules like antibodies.

Lymphoid organs: These are the organs where origin and/or maturation and proliferation of lymphocytes occur.

**The primary lymphoid organs are bone marrow and thymus** where immature lymphocytes differentiate into antigen-sensitive lymphocytes.

After maturation the lymphocytes migrate to secondary lymphoid organs like spleen, lymph nodes, tonsils, Peyer's patches of small intestine and appendix. **The secondary lymphoid organs provide the sites for interaction of lymphocytes with the antigen, which then proliferate to become effector cells.**

- 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.
- **Both bone-marrow and thymus provide micro-environments for the development and maturation of T-Lymphocytes.**
- The spleen is a large bean shaped organ. It mainly contains lymphocytes and phagocytes. It acts as a filter of the blood by trapping blood-borne microorganisms. Spleen also 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 micro-organisms or other antigens, which happen to get into the lymph and tissue fluid.
• Antigens trapped in the lymph nodes are responsible for the activation of lymphocytes present there and cause the immune response. 

There is lymphoid tissue also located within the lining of the major tracts (respiratory, digestive and urogenital tracts) called mucosal associated lymphoid tissue (MALT). It constitutes about 50 per cent of the lymphoid tissue in human body.

AIDS

The word AIDS stands for Acquired Immuno Deficiency Syndrome. This means deficiency of immune system, acquired during the lifetime of an individual indicating that it is not a congenital disease. ‘Syndrome’ means a group of symptoms. AIDS was first reported in 1981 and in the last twenty-five years or so, it has spread all over the world killing more than 25 million persons.

AIDS is caused by the Human Immuno deficiency Virus (HIV), a member of a group of viruses called retrovirus, which have an envelope enclosing the RNA genome.

Transmission of HIV-infection generally occurs by
(a) Sexual contact with infected person,
(b) By transfusion of contaminated blood and blood products,
(c) By sharing infected needles as in the case of intravenous drug abusers and
(d) From infected mother to her child through placenta.

• So, people who are at high risk of getting this infection includes - individuals who have multiple sexual partners, drug addicts who take drugs intravenously, individuals who require repeated blood transfusions and children born to an HIV infected mother.

• It is important to note that HIV/AIDS is not spread by mere touch or physical contact; it spreads only through body fluids. It is, hence, imperative, for the physical and psychological well-being, that the HIV/AIDS infected persons are not isolated from family and society.

• There is always a time-lag between the infection and appearance of AIDS symptoms. This period may vary from a few months to many years (usually 5-10 years).

• After getting into the body of the person, the virus enters into macrophages where RNA genome of the virus replicates to form viral DNA with the help of the enzyme reverse transcriptase.

• This viral DNA gets incorporated into host cell’s DNA and directs the infected cells to produce virus particles. The macrophages continue to produce virus and in this way acts like a HIV factory.

• Simultaneously, HIV enters into helper T-lymphocytes (TH), replicates and produce progeny viruses. The progeny viruses released in the blood attack other helper T-lymphocytes.

• This is repeated leading to a progressive decrease in the number of helper T-lymphocytes in the body of the infected person.

• During this period, the person suffers from bouts of fever, diarrhoea and weight loss. Due to decrease in the number of helper T lymphocytes, the person starts suffering from infections that could have been otherwise overcome such as those due to bacteria especially Mycobacterium, viruses, fungi and even parasites like Toxoplasma.

• The patient becomes so Immuno-deficient that he/she is unable to protect himself/herself against these infections.

A widely used diagnostic test for AIDS is enzyme linked Immuno-sorbent assay (ELISA).
Treatment of AIDS with anti-retroviral drugs is only partially effective. They can only prolong the life of the patient but cannot prevent death, which is inevitable.

- Prevention of AIDS: As AIDS has no cure, prevention is the best option.
- Moreover, HIV infection, more often, spreads due to conscious behavior patterns and is not something that happens inadvertently, like pneumonia or typhoid.
- Of course, infection in blood transfusion patients, new-borns (from mother) etc., may take place due to poor monitoring.
- The only excuse may be ignorance and it has been rightly said – “don't die of ignorance”.
- In our country the National AIDS Control Organisation (NACO) and other non-governmental organisation (NGOs) are doing a lot to educate people about AIDS.
- WHO has started a number of programmes to prevent the spreading of HIV infection. Making blood (from blood banks) safe from HIV, ensuring the use of only disposable needles and syringes in public and private hospitals and clinics, free distribution of condoms, controlling drug abuse, advocating safe sex and promoting regular check-ups for HIV in susceptible populations, are some such steps taken up.

- Unless society recognizes it as a problem to be dealt with in a collective manner – the chances of wider spread of the disease increase manifold.

CANCER
Cancer is one of the most dreaded diseases of human beings and is a major cause of death all over the globe. The mechanisms that underlie development of cancer or oncogenic transformation of cells, its treatment and control have been some of the most intense areas of research in biology and medicine.

In our body, cell growth and differentiation is highly controlled and regulated. In cancer cells, there is breakdown of these regulatory mechanisms.

Normal cells show a property called contact inhibition by virtue of which contact with other cells inhibits their uncontrolled growth.

Cancer cells appear to have lost this property. As a result of this, cancerous cells just 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 and cause little damage.

The malignant tumors, on the other hand are a mass of proliferating cells called neoplastic or tumor cells. These cells grow very rapidly, invading and damaging the surrounding normal tissues. As these cells actively divide and grow they also starve the normal cells by competing for vital nutrients.

Cells sloughed from such tumors reach distant sites through blood, and wherever they get lodged in the body, they start a new tumor there. This property called metastasis is the most feared property of malignant tumors.

Causes of cancer: Transformation of normal cells into cancerous neoplastic cells may be induced by physical, chemical or biological agents. These agents are called carcinogens.

- Ionizing radiations like X-rays and gamma rays and non-ionizing radiations like UV cause DNA damage leading to neoplastic transformation.
- The chemical carcinogens present in tobacco smoke have been identified as a major cause of lung cancer.
- Cancer causing viruses called oncogenic viruses have genes called viral oncogenes.
- Furthermore, several genes called cellular oncogenes (c-onc) or proto oncogenes have been identified in normal cells which, when activated under certain conditions, could lead to oncogenic transformation of the cells.

Cancer detection and diagnosis:
Cancer detection is based on biopsy and histopathological studies of the tissue and blood and bone marrow tests for increased cell counts in the case of leukemias.

- **In biopsy**, a piece of the suspected tissue cut into thin sections is stained and examined under microscope (histopathological studies) by a pathologist.
- Techniques like radiography (use of X-rays), CT (computed tomography) and MRI (magnetic resonance imaging) are very useful to detect cancers of the internal organs. Computed tomography uses X-rays to generate a three-dimensional image of the internals of an object. MRI uses strong magnetic fields and non-ionizing radiations to accurately detect pathological and physiological changes in the living tissue.
- Antibodies against cancer-specific antigens are also used for detection of certain cancers. Techniques of molecular biology can be applied to detect genes in individuals with inherited susceptibility to certain cancers. Identification of such genes, which predispose an individual to certain cancers, may be very helpful in prevention of cancers.

Such individuals may be advised to avoid exposure to particular carcinogens to which they are susceptible (e.g., tobacco smoke in case of lung cancer).

**Treatment of cancer:**

In radiotherapy, tumor cells are irradiated lethally, taking proper care of the normal tissues surrounding the tumor mass.

Several chemotherapeutic drugs are used to kill cancerous cells. Some of these are specific for particular tumors. Majority of drugs have side effects like hair loss, anemia, etc.

Most cancers are treated by combination of surgery, radiotherapy and chemotherapy.

Tumor cells have been shown to avoid detection and destruction by immune system. Therefore, the patients are given substances called biological response modifiers such as α-interferon which activate their immune system and help in destroying the tumor.

**DRUGS AND ALCOHOL ABUSE**

The drugs, which are commonly abused are opioids, cannabinoids and coca alkaloids. Majority of these are obtained from flowering plants. Some are obtained from fungi.

Opioids are the drugs, which bind to specific opioids receptors present in our central nervous system and gastrointestinal tract.

1. **Heroin**, commonly called *smack* is chemically diacetyl morphine which is a white, odourless, bitter crystalline compound. This is obtained by acetylation of morphine, which is extracted from the latex of poppy plant *Papaver somniferum*.
   Generally taken by snorting and injection, heroin is a depressant and slows down body functions.

2. Cannabinoids are a group of chemicals, which interact with cannabinoids 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.
   Generally taken by inhalation and oral ingestion, these are known for their effects on cardiovascular system of the body.

3. Coca alkaloid or cocaine is obtained from coca plant *Erythroxylum coca*, native to South America. It interferes with the transport of the neurotransmitter dopamine.
   Cocaine, commonly called coke or crack is usually snorted. It has a potent stimulating action on central nervous system, producing a sense of euphoria and increased energy. Excessive dosage of cocaine causes hallucinations.

4. Other well-known plants with hallucinogenic properties are *Atropa belladona* and *Datura*. These days’ cannabinoids are also being abused by some sportspersons.
• Drugs like barbiturates, amphetamines, benzodiazepines, lysergic acid diethyl amides (LSD), and other similar drugs, that are normally used as medicines to help patients cope with mental illnesses like depression and insomnia, are often abused.
• Morphine is a very effective sedative and painkiller, and is very useful in patients who have undergone surgery. Several plants, fruits and seeds having hallucinogenic properties have been used for hundreds of years in folk-medicine, religious ceremonies and rituals all over the globe.

When these are taken for a purpose other than medicinal use or in amounts/frequency that impairs one’s physical, physiological or psychological functions, it constitutes drug abuse.

Tobacco has been used by human beings for more than 400 years. It is smoked, chewed or used as a snuff. 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.
Smoking is associated with increased incidence of cancers of lung, urinary bladder and throat, bronchitis, emphysema, coronary heart disease, gastric ulcer, etc.

Tobacco chewing is associated with increased risk of cancer of the oral cavity.
Smoking increases carbon monoxide (CO) content in blood and reduces the concentration of haembound oxygen. This causes oxygen deficiency in the body.

**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.
- The period between 12-18 years of age may be thought of as adolescence period.
- In other words, adolescence is a bridge linking childhood and adulthood.
- Adolescence is accompanied by several biological and behavioural changes.
- Adolescence thus is a very vulnerable phase of mental and psychological development of an individual.
- Curiosity, need for adventure and excitement, and experimentation, constitute common causes, which motivate youngsters towards drug and alcohol use.
- A child's natural curiosity motivates him/her to experiment. This is complicated further by effects that might be perceived as benefits, of alcohol or drug use.
- Thus, the first use of drugs or alcohol may be out of curiosity or experimentation, but later the child starts using these to escape facing problems.
- Of late, stress, from pressures to excel in academics or examinations, has played a significant role in persuading the youngsters to try alcohol and drugs.
- The perception among youth that it is ‘cool’ or progressive to smoke, use drugs or alcohol, is also in a way a major cause for youth to start these habits.
- Television, movies, newspapers, internet also help to promote this perception.
- Other factors that have been seen to be associated with drug and alcohol abuse among adolescents are unstable or unsupportive family structures and peer pressure.

**Addiction and Dependence**

- Because of the perceived benefits, drugs are frequently used repeatedly.
- The most important thing, which one fails to realize, is the inherent addictive nature of alcohol and drugs. Addiction is a psychological attachment to certain effects –such as euphoria and a temporary feeling of well-being – associated with drugs and alcohol.
- These drive people to take them even when these are not needed, or even when their use becomes self-destructive.
- With repeated use of drugs, the tolerance level of the receptors present in our body increases. Consequently the receptors respond only to higher doses of drugs or alcohol leading to greater intake and addiction.
• In the absence of any guidance or counseling, the person gets addicted and becomes dependent on their use.

• Dependence is the tendency of the body to manifest a characteristic and unpleasant withdrawal syndrome if regular dose of drugs/alcohol is abruptly discontinued.

• This is characterized by anxiety, shakiness, and nausea and sweating, which may be relieved when use is resumed again.

• In some cases, withdrawal symptoms can be severe and even life threatening and the person may need medical supervision.

• Dependence leads the patient to ignore all social norms in order to get sufficient funds to satiate his/her needs. These result in many social adjustment problems.

**Effects of Drug/Alcohol Abuse**

• The immediate adverse effects of drugs and alcohol abuse are manifested in the form of reckless behaviour, vandalism and violence.

• Excessive doses of drugs may lead to coma and death due to respiratory failure, heart failure or cerebral hemorrhage.

• A combination of drugs or their intake along with alcohol generally results in overdosing and even deaths.

• The most common warning signs of drug and alcohol abuse among youth include drop in academic performance, unexplained absence from school/college, lack of interest in personal hygiene, withdrawal, isolation, depression, fatigue, aggressive and rebellious behaviour, deteriorating relationships with family and friends, loss of interest in hobbies, change in sleeping and eating habits, fluctuations in weight, appetite, etc.

• Those who take drugs intravenously (direct injection into the vein using a needle and syringe), are much more likely to acquire serious infections like AIDS and hepatitis B. The viruses, which are responsible for these diseases, are transferred from one person to another by sharing of infected needles and syringes. Both AIDS and Hepatitis B infections are chronic infections and ultimately fatal. AIDS can be transmitted to one’s life partner through sexual contact while Hepatitis B is transmitted through infected blood.

• The use of alcohol during adolescence may also have long-term effects. It could lead to heavy drinking in adulthood. The chronic use of drugs and alcohol damages nervous system and liver (cirrhosis). The use of drugs and alcohol during pregnancy is also known to adversely affect the foetus.

• Another misuse of drugs is what certain sportspersons do to enhance their performance. They (mis)use narcotic analgesics, anabolic steroids, diuretics and certain hormones in sports to increase muscle strength and bulk and to promote aggressiveness and as a result increase athletic performance.

• The side-effects of the use of anabolic steroids in females include masculinisation (features like males), increased aggressiveness, mood swings, depression, abnormal menstrual cycles, excessive hair growth on the face and body, enlargement of clitoris, deepening of voice.

• In males it includes acne, increased aggressiveness, mood swings, depression, and reduction of size of the testicles, decreased sperm production, potential for kidney and liver dysfunction, breast enlargement, premature baldness, enlargement of the prostate gland. These effects may be permanent with prolonged use.

**Prevention and Control**

It is best to identify the situations that may push an adolescent towards use of drugs or alcohol, and to take remedial measures well in time.

In this regard, the parents and the teachers have a special responsibility.

Parenting that combines with high levels of nurturance and consistent discipline, has been associated with lowered risk of substance (alcohol/drugs/tobacco) abuse.
(i) **Avoid undue peer pressure** - A child should not be pushed unduly to perform beyond his/her threshold limits; be it studies, sports or other activities.

(ii) **Education and counseling** - Educating and counseling him/her to face problems and stresses, and to accept disappointments and failures as a part of life. It would also be worthwhile to channelize the child's energy into healthy pursuits like sports, reading, music, yoga and other extracurricular activities.

(iii) **Seeking help from parents and peers** - Help from parents and peers should be sought immediately so that they can guide appropriately.

(iv) **Looking for danger signs** - Even friends, if they find someone using drugs or alcohol, should not hesitate to bring this to the notice of parents or teacher in the best interests of the person concerned.

(v) **Seeking professional and medical help** - A lot of help is available in the form of highly qualified psychologists, psychiatrists, and **deaddiction and rehabilitation programmes** to help individuals who have unfortunately got in the quagmire of drug/alcohol abuse.

**-IMPORTANT DIAGRAMMES WHICH CAN BE USED FOR PUTTING QUESTIONS-**

[Diagram of Antibody Structure](#)

[Diagram of Lymphatic System](#)
LIFE CYCLE OF PLASMODIUM

CHEMICAL STRUCTURE – MORPHINE

OPIUM POPPY
ONE MARKS QUESTIONS

1. List the factors affecting the health.
2. What are communicable diseases? Give two examples.
3. Name four types of non-communicable diseases.
4. Name the diseases which have long term effects on human health. Give two examples.
5. Which two factors determine the intensity of disease?
6. Define vaccine.
7. Name two diseases whose pathogens show Transplacental transmission.
8. Who are typhoid carriers?
9. Why DPT is called triple vaccine?
10. Why tetanus is also called as lock-jaw disease?
11. For which diseases mantoux test is employed for its diagnosis?
12. Who is commonly called father of immunology?
13. Expand the term NMEP.
15. Give the common site of formation of two types of lymphocytes.
<table>
<thead>
<tr>
<th>Q. No.</th>
<th>Question</th>
</tr>
</thead>
<tbody>
<tr>
<td>16</td>
<td>What is the site of the differentiation of two types of lymphocytes?</td>
</tr>
<tr>
<td>17</td>
<td>Name the most abundant immunoglobulin in human.</td>
</tr>
<tr>
<td>18</td>
<td>What are interferons?</td>
</tr>
<tr>
<td>19</td>
<td>Which types of antibodies are present in the colostrum?</td>
</tr>
<tr>
<td>20</td>
<td>What is the principle of vaccination?</td>
</tr>
<tr>
<td>21</td>
<td>Give the term for giving performed antibodies against snake venom.</td>
</tr>
<tr>
<td>22</td>
<td>What are autoimmune diseases?</td>
</tr>
<tr>
<td>23</td>
<td>Why autoimmune diseases are called degenerative diseases?</td>
</tr>
<tr>
<td>24</td>
<td>Name the autoimmune disease of body muscles.</td>
</tr>
<tr>
<td>25</td>
<td>Why SCID is called primary immunodeficiency?</td>
</tr>
<tr>
<td>26</td>
<td>Why AIDS is called the secondary Immuno-deficiency disease?</td>
</tr>
<tr>
<td>27</td>
<td>What are opportunists?</td>
</tr>
<tr>
<td>28</td>
<td>Which types of cells are destroyed by HIV?</td>
</tr>
<tr>
<td>29</td>
<td>Expand the term ARC and NACO.</td>
</tr>
<tr>
<td>30</td>
<td>Which day is celebrated as AIDS day?</td>
</tr>
<tr>
<td>31</td>
<td>Define proto-oncogenes.</td>
</tr>
<tr>
<td>32</td>
<td>Which carcinogen causes the liver cancer?</td>
</tr>
<tr>
<td>33</td>
<td>Name the carcinogens present in cigarette smoke.</td>
</tr>
<tr>
<td>34</td>
<td>On the national basis which cancer is most common in India?</td>
</tr>
<tr>
<td>35</td>
<td>At the world level which cancer is most common?</td>
</tr>
<tr>
<td>36</td>
<td>What are onco-viruses?</td>
</tr>
<tr>
<td>37</td>
<td>Name anticancerous drugs derived from the plant Catharanthus roseus (Sadabahar).</td>
</tr>
<tr>
<td>38</td>
<td>Name two chemicals present in the tobacco plant.</td>
</tr>
<tr>
<td>39</td>
<td>Which day is celebrated as No-Tobacco-Day?</td>
</tr>
<tr>
<td>40</td>
<td>What is the common name of tobacco?</td>
</tr>
<tr>
<td>41</td>
<td>Name the liver disorder which is associated with alcoholism?</td>
</tr>
<tr>
<td>42</td>
<td>Give the ill effect of the alcohol on cerebellum.</td>
</tr>
<tr>
<td>43</td>
<td>Name four categories of the drugs.</td>
</tr>
<tr>
<td>44</td>
<td>Give the source of caffeine.</td>
</tr>
<tr>
<td>45</td>
<td>What is crack?</td>
</tr>
<tr>
<td>46</td>
<td>Give the specific name to blood cancer and infantile paralysis.</td>
</tr>
<tr>
<td>47</td>
<td>What are pyrogens?</td>
</tr>
<tr>
<td>48</td>
<td>What are lysozymes? Give its function.</td>
</tr>
<tr>
<td>49</td>
<td>What are autoantigens in Myasthenia gravis and Hoshimoto's syndrome?</td>
</tr>
<tr>
<td>50</td>
<td>Which chemical of tobacco cause emphysema and hypertension?</td>
</tr>
<tr>
<td>51</td>
<td>What are cannabinoids?</td>
</tr>
<tr>
<td>52</td>
<td>Which category of adaptive immunity is provided by vaccination?</td>
</tr>
</tbody>
</table>

**SOLUTIONS ONE MARKS QUESTIONS**

<table>
<thead>
<tr>
<th>Q. No.</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Physical and social environment and improper nutrition.</td>
</tr>
<tr>
<td>2</td>
<td>Disease which can spread from infected person to healthy person e.g. Typhoid, Pneumonia, Cholera, etc.</td>
</tr>
</tbody>
</table>
| 3      | i. Deficiency diseases- Diabetes mellitus ii. Degenerative diseases- Arthritis  
<p>| 4      | Chronic diseases e.g. TB and Elephantiasis                                   |
| 5      | Numbers of microbes infecting the body and Target organ of the microbes    |
| 6      | An inoculation which stimulate immune system of the body to produce antibodies.|
| 7      | German measles- Viral and Syphilis- Bacterial                               |
| 8      | Persons who have recovered from typhoid though continue to spread the bacteria of disease.                                             |
| 9      | It provide resistance against three diseases- Diphtheria, Pertussis and Whooping cough  |
| 10     | Bacterial toxins cause degeneration of motor neurons and spasmodic contraction of jaw muscles so it is difficult to open the jaws.             |
| 11     | Tuberculosis                                                                |
| 12     | Edward Jenner                                                              |
| 13     | National Malaria Eradication Programme                                       |
| 14     | Fungi like Microsporum, Trichophyton and Epidermophyton                      |
| 15     | Haemocytoblasts or stem cells of bone marrow                                |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
</table>
| 16 | B-lymphocytes are differentiated in Payer's patches, tonsils and appendix and bursa of fabricus in birds.  
T-lymphocytes differentiates in thymus gland  |
| 17 | IgG  |
| 18 | Anti viral, chemicals released outside by virus infected cells.  |
| 19 | IgA  |
| 20 | On the principle of “memory” of the immune system.  |
| 21 | Passive immunization  |
| 22 | Disorders in which immune system of an individual starts rejecting its own body cells.  |
| 23 | In these diseases certain body cells undergo degeneration.  |
| 24 | Myasthenia gravis  |
| 25 | Because it is a congenital Immuno deficiency.  |
| 26 | Because it is an acquired disease.  |
| 27 | AIDS-infected clinically unhealthy persons  |
| 28 | Helper T-lymphocytes  |
| 29 | AIDS-related complex and National AIDS control organization  |
| 30 | December-1  |
| 31 | Inactive cancer causing genes  |
| 32 | Aflotoxin from fungus Aspergillus  |
| 33 | Benzyprene and N-nitrosodimethylene  |
| 34 | Mouth-throat cancer in male and Cervical-uterine cancer in females.  |
| 35 | Breast cancer  |
| 36 | Cancer causing viruses- Epstein-Barr virus, Herpes simplex-2 virus  |
| 37 | Vincristin and Vinblastin  |
| 38 | Benzyprene and Nicotine  |
| 39 | May-31  |
| 40 | Killer weed  |
| 41 | Fatty acid syndrome also called cirrhosis  |
| 42 | Improper muscle coordination, so alcoholic suffers from staggering gait and incoherent speech  |
| 43 | i. Sedatives and Tranquilizers ii. Narcotics  
   ii. Stimulants and iv. Hallucinogens  |
| 44 | Seeds of coffee plant- Coffea arabica  |
| 45 | Purified form of cocaine  |
| 46 | Leukemia and Poliomyelitis  |
| 47 | Chemicals which cause increase in body temperature  |
| 48 | Lytic enzymes present in the saliva and tears- They cause the lysis of bacterial cell wall  |
| 49 | Muscle cells and low level of thyroxin.  |
| 50 | Nicotine  |
| 51 | Chemicals derived from the hemp plant and binds the receptors present in the brain  |
| 52 | Active immunity  |

**TWO MARKS QUESTIONS**

1. Differentiate between antigen and antibody.
2. How do the humeral and cell mediated immune system differ from each other?
3. List the main risk groups responsible for the spread of AIDS.
4. Differentiate between proto-oncogenes and oncogenes.
5. List four danger signals of cancer.
6. What is metastasis? Why is it more dangerous?
7. Define addiction. List three types of addiction.
8. Give the source and biological effect of LSD.
9. Discuss the ill effect of alcohol on cerebrum.
10. What are stimulants? List various stimulants and their sources.
11. Define hallucinogens. Which hallucinogens are derived from the hemp plants?
12. Name the infectious disease which causes wasting of body parts. Give the scientific name of the pathogen and mention the body organs it primarily affects.
13. What are allergens? How do they cause inflammatory response?
14. What is the basis of classifying cancers? List two categories of cancers.
15. Name the cells that produced antibodies. Explain their main functions.
16 Fill in the blanks in the different columns of the table given below.

<table>
<thead>
<tr>
<th>Disease</th>
<th>Causative agent</th>
<th>Medium of transfer</th>
<th>Symptoms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Filariasis</td>
<td><em>Wuchereria</em></td>
<td>A</td>
<td>Lymphatic vessels of the lower limbs are affected</td>
</tr>
<tr>
<td>Trichophyton</td>
<td><em>Trichophyton</em></td>
<td>B</td>
<td>Using towels of infected person, dry, scaly lesions on body</td>
</tr>
<tr>
<td>Common cold</td>
<td>C</td>
<td></td>
<td>Droplets from sneezing of infected person, affect nose and respiratory passage, sore throat</td>
</tr>
<tr>
<td>Ascariasis</td>
<td><em>Ascaris</em></td>
<td>D</td>
<td>Through contaminated water, vegetables and fruits</td>
</tr>
</tbody>
</table>

17 In which part of the body of the hosts do the following events in the life cycle of Plasmodium vivex takes place?
   1. Fertilization
   2. Development of gametes
   3. Release of sporozoites
   4. Asexual reproduction

18 A person injured in a road accident and requiring an urgent immune response was brought to a doctor.
   a. What did the doctor immediately do?
   b. What kind of immunity was he providing?
   c. Define the kind of immunity.

19 i. In which disease is there an uncontrolled division of cells resulting in the formation of tumours? How this disease is detected?
   ii. How do interferons help in controlling the disease?

20 How the transmission of each of the following diseases takes place?
   i. Amoebiasis
   ii. Malaria
   iii. Ascariasis
   iv. Pneumonia

21 Discuss with your teacher what does “a suitable gene” means in the context of DNA vaccine.

SOLUTION TWO MARKS QUESTIONS

1 Antigens are those external agents, which when enter the body are capable of stimulating the immune cells, while antibodies are the defensive chemicals produced by the immune cells to neutralize these agents.

2 Humoral immune system is formed of antibodies produced by B-lymphocytes and protect the body from those bacteria and viruses which enter the blood and lymph, while cell mediated immune system is formed of T-lymphocytes which kill the microbes or reject the allografts or autoantigens.

3 Main risk groups of the AIDS are
   i. Homosexuals
<table>
<thead>
<tr>
<th>4</th>
<th>Proto-oncogenes are inactive or dormant cancer causing genes, while active cancer causing genes are called oncogenes.</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>Presence of a persistent tumour in lip tongue and breast</td>
</tr>
<tr>
<td>6</td>
<td>Metastasis is the spread of cancer from the primary organ to a number of secondary organs of the body to form secondary tumours.</td>
</tr>
<tr>
<td>7</td>
<td>Addiction is the physical and mental dependency and is of three types- Smocking Alcoholism and Drug abuse</td>
</tr>
<tr>
<td>8</td>
<td>Presence of a persistent tumour in lip tongue and breast</td>
</tr>
<tr>
<td>9</td>
<td>Presence of a persistent tumour in lip tongue and breast</td>
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<tr>
<td>10</td>
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<tr>
<td>15</td>
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<tr>
<td>16</td>
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<tr>
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</tr>
</tbody>
</table>
interferons are anti-viral proteins which are produced by virus infected cells and prepare the non-infected cells to resist the viral attack.

<table>
<thead>
<tr>
<th>Disease</th>
<th>Mode of transmission</th>
</tr>
</thead>
<tbody>
<tr>
<td>amoebiasis</td>
<td>Direct and oral- The teranucleated cysts are ingested with the contaminated food and water</td>
</tr>
<tr>
<td>malaria</td>
<td>Indirect and inoculative- The sporozoites are introduced along with the saliva of female Anophelese mosquitoes</td>
</tr>
<tr>
<td>ascariasis</td>
<td>Direct and oral- Capsules with second juveniles are ingested with the contaminated food and water</td>
</tr>
<tr>
<td>pneumonia</td>
<td>Air borne or through droplet infection or contaminated utensils or aerosols- Bacterial cysts are spread by the sputum of the patient</td>
</tr>
</tbody>
</table>

suitable gene- means that a disease resistant gene present on the genome of lower organisms. By the technique of genetic engineering, this suitable gene is transferred in a vaccine to inject in human beings to induce the development of immunity.

three marks questions

1. how a cancerous cell is different from the normal cell?
2. draw a well labeled diagram of an antibody molecule.
3. name two bacterial and two viral diseases of man and mention how these are combated?
4. list the cause, symptoms and prophylactic measures of
   i. amoebiasis
   ii. typhoid
5. tabulate the cause, symptoms and preventive measures of
   i. pneumonia
   ii. filariasis
6. describe the three types of t-lymphocytes and give their functions.
7. differentiate between immunodeficiency and autoimmunity giving one example of each.
8. what is addiction? Give the source of tobacco. list the ill effect of nicotine.
9. what is metastasis? list the danger signals of cancer.
10. what are carcinogens? name two carcinogens. also explain the term malignancy.
11. write the full form of scid and mention the cause of this congenital disorder. mention any one point how scid is different from aids.
12. what is the role of each in body defense-
   i. pyrogens
   ii. lysozymes
   iii. helper t-cells
13. what is the role of each in body defense-
   i. antihistamine
   ii. plasma cells
   iii. suppressor t-cells
14. differentiate between t-cells and b-cells.
15. explain the term primary lymphoid organs and secondary lymphoid organs with examples.
16. a person has been diagnosed to be hiv positive.
   i. name the test which person underwent.
   ii. write the full name of the pathogen involved and describe its structure.
   iii. which particular cells of this person are likely to be destroyed?
17. Name various immunoglobulins and give their functions.
18. What are the properties of acquired immunity? Differentiate between the antigen and antibody.
19. Draw the flow chart to depict the multiplication of an HIV virus in a host cell.

**SOLUTIONS THREE MARKS QUESTIONS**

1. i. Cancer cells undergo uncontrolled growth and uncontrolled mitotic division of cells.
   ii. Cancer cells do not show contact inhibition as found in normal cells.
   iii. Cancer cells lead to the formation of tumour (also called neoplasm).
   iv. These have less survival capability than the normal cells.
   v. These cells have high invasiveness.

2. ![Antigen binding site](image)

**FIVE MARKS QUESTIONS**

1. List the harmful effect caused by alcohol/drug abuse.
2. In your view, what motivates the youngsters to take to alcohol or drugs and how can this be avoided?
3. Define the following terms:
   i. Innate immunity
   ii. Immunology
   iii. Antigen
   iv. Vaccine
   v. Acquired immunity
4. Discuss the role of following with reference to immunity:
   i. Antibodies
   ii. Helper T-cells
   iii. Interferons
   iv. Phagocytes
5. Write a short notes on:
   i. Characteristics of cancer cells
   ii. Therapeutic measures against cancer
6. What are narcotics? Discuss the source, withdrawal symptoms and treatment of opioids toxicity.
7. What is immune system? What are its main kinds? What is the role of B-type and T-type cells in the body's defensive mechanism?
8. Define immunodeficiency. Give a brief account of AIDS.

**SOLUTIONS FIVE MARKS QUESTIONS**

1. i. Harmful effects of alcohol
   a. Alcohol has anesthetic effect and intoxication on the cerebrum and cerebellum of brain due to which alcoholic suffers from the loss of judgment, will power, emotional control, visual problems, antisocial behaviour, incoherent speech, staggering gait, neuritis etc.
   b. Gastritis and peptic ulcer as alcohol cause increase secretion of HCl.
   c. Cirrhosis of liver in which liver becomes storehouse of fats.
   d. Increased deposition of fats on the walls of blood vessels which causes increased blood pressure and cardiomyopathy.
   ii. Harmful effect of drugs
   a) Opiates act as depressant and the excess consumption of opiates may cause death due to blockage of respiration
   b) Stimulants likeamphetamine impair vision and judgment of distance
   c) Overdose of cocaine may cause death due to cardiovascular or respiratory failure
   d) LSD is most dangerous hallucinogen which is known to cause chromosomal and foetal abnormalities.
Main motivating factors which stimulates the youngsters to take to alcohol or drugs are-

a. Peer pressure  
b. Desire of excitement  
c. Liking of taste  
d. To escape from frustrations  
e. Family’s history  
f. Curiosity due to advertisements  
g. False belief of enhanced performance

Alcohol or drug abuse can be avoided by-

1. To identify the reasons of addiction and to take remedial measures  
2. Avoid undue pressure of peer groups  
3. By giving proper education and counseling of adults  
4. Seeking help from parents, teachers and trusted friends  
5. Seeking professional and medical help

HIGH ORDER THINKING QUESTIONS - HUMAN HEALTH AND DISEASES

1. A person is physical fit, exercises, eats balanced diet but his neighborhood was always noisy which disturbed his sleep. How can this situation affect the health of the person? Does this situation fit into the definition of health?

2. ‘Child who had some watery boils on skin. The doctor diagnosed it to be chickenpox. When the same child reported to the school for final exams. The teacher did not allow the child to sit with the other students.’ What is your opinion about the decision taken by the teacher? Did the teacher do any injustice with the child or with the school administrative rulings?

3. How do you think microorganisms are a foe to humans? What medical terminology has been suggested for such organisms?

4. Mary Mallon, a cook along with her delicious food was also spreading Typhoid to many people. How could she do that without suffering or even knowing about it? What was she nicknamed as? Also name the test conducted for the confirmation of the above disease?

5. ‘Rahul was suffering from common cold and was severely coughing and sneezing in the class. His science teacher asked him to use his handkerchief and also explained the reason to do so.’ What could have been the reason behind the decision taken by the teacher?

6. The doctor on examining a particular patient found that his lips and fingernails had turned gray and the patient was also feeling un-healthy. What diagnosis did the doctor made? What other symptoms could he have observed in the patient?

7. A doctor was explaining to his students about a particular disease vector that booms particularly during the rainy season (warm and humid). He also explained that one of the types of this disease can show shivering effect and may be fatal. Name the type and its causative agent. Also explain the reason for the other symptoms of the disease?

8. A person was found to be affected by uni-lateral swelling of the lower extremity. On getting the history of swelling, it was noticed that it started with numbness of the feet and then spread upwards mainly due to fluid retention. Is there any problematic situation. Justify your reasoning. Can it be transmitted?

9. ‘Breast feeding a baby is recommended by the doctors, particularly for first few days after birth.’ Why and what makes it the best food source?

10. The property of “Memory” is observed in computers. Can you relate the same property to vaccination and immune system?

11. Talking of defenses of a country, we know that there are barriers which prevent the entry of foreign agents into our country. Correlate this data with the defenses of the body and name some of the
<table>
<thead>
<tr>
<th>Question</th>
<th>Answer</th>
</tr>
</thead>
<tbody>
<tr>
<td>barriers of our body and what term is given for such defense/immunity?</td>
<td></td>
</tr>
<tr>
<td>12 On encountering a pathogen for the first time the response is generally low, but on second exposure to the same pathogen a highly intensified response is shown by the body. Give justification for this observation?</td>
<td></td>
</tr>
<tr>
<td>13 Simran after coming from the garden found that she had running nose, sneezing and Watery eyes. What was the reason her specialist must have told her and what drugs must he have prescribed?</td>
<td></td>
</tr>
<tr>
<td>14 Body has a large reservoir of erythrocytes. Is it a passive or active store house? Validate your answer?</td>
<td></td>
</tr>
<tr>
<td>15 Rahul was suffering from the malfunctions of kidneys and need a replacement. His friend comes forward to donate him a kidney but after thorough examination the doctors refused to accept the kidney. Why he was refused to donate and what is it that the doctors check?</td>
<td></td>
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<td>16 Shoib Akthar is very much particular about his performance. Recently he was medically unfit and was not allowed to play the match. What went wrong and what do the sportspersons do to enhance their performance?</td>
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<td>17 Raju was curious to experiment a new brand of cigarette. Later on he found that he was unable to quit smoking. Can this lead to addiction and what other problems can crop up?</td>
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<td>18 It was diagnosed by a specialist that the immune system of a patient has been suppressed. A special test was done for confirmation. Name the test as well as the disease the patient was suffering? Also give its causative agent?</td>
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<td>19 On examining a patient, he had a mass of proliferating cells damaging the neighboring tissues also. The doctor explained the disease to the patient. Name the disease and its property?</td>
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**HIGH ORDER THINKING QUESTIONS - SOLUTIONS**

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<tr>
<th>Question</th>
<th>Answer</th>
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| 1 | No, he is not mentally fit. According to WHO- “health is the state of physical, mental and social well being”.
| 2 | Chicken pox is highly contagious/communicable disease. It could have spread to other students. So, no injustice on either side. |
| 3 | Microbes Cause several kinds of diseases. Pathogens/disease causing microorganisms. |
| 4 | She was a carrier of typhoid. She unknowingly was spreading typhoid through the food she prepared. Typhoid Mary. Widal test |
| 5 | Handkerchief would check the spread of droplet infection (microbes spread in the air) that can contaminate the object with infectious agents/pathogens. |
| 6 | Suffering from advanced stage of pneumonia. Symptoms: fever, chill, cough, headache |
| 7 | Malaria-C.O.(Pathogen).Plasmodium falciparum Reasons for symptoms. - Parasite attacks the RBCs and rupture then with the release of a toxin – haemozoin which is responsible for chill and high fever. |
| 8 | Filariasis, Wuchereria bancrofti, Lymphatic vessels, genital organs and lower limbs. |
| 9 | It gives passive immunity. The yellowish fluid colostrum secreted by the mother during initial days of lactation has abundant antibodies (IG A) to boost the immunity as the defense system is still weak. |
| 10 | In vaccination, vaccines generate memories.-B-and T-cells recognize the pathogen quickly and invade with the massive production of antibodies. |
| 11 | Barriers:- Physical (skin), Physiological (saliva), Cellular (WBC), Cytokine (interferons) Innate immunity (in born immunity) |
| 12 | Body has memory of the first encounter with the pathogen. This recognizes the pathogen and shows heightened immune response. |
Suffering from allergy.

Drugs – Anti-histamine, adrenaline and steroids.

Spleen. It acts as the filter of the blood by trapping blood borne micro-organism.

He underwent blood group and tissue typing / matching because the body is able to differentiate between self non self. Defense systems may generate cell mediated immune response.

Detection of banned drugs in a blood test. Steroids are used to temporarily enhance the performance. They misuse narcotic analgesic, anabolic steroids, diuretics and certain hormones to increase muscle strength.

Yes, increased incidence of lung cancer, coronary heart diseases, emphysema etc.

ELISA, AIDS, HIV (Human Immunodeficiency virus)

Malignant tumour, Metastasis

Prolonged exposure to ionic radiation is carcinogenic. Oncogenic viruses, cellular oncogenes or proto-oncogenes on transformation can cause cancer.

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