Chapter

30 Human Health and Disease

Health is a state of complete physical, mental and social well-being. It increases the productivity and ensures longevity.

Ways to ensure good health

- ➢ Balanced diet
- ➢ Personal hygiene
- ➢ Exercise
- ➢ Awareness about prevention and control of diseases
- ➢ Proper waste disposal and control of vectors
- ➢ Vaccination

- **Health is affected by**
  - ➢ Genetic disorders
  - ➢ Infections
  - ➢ Sedentary life style which includes junk food, lack of exercise, habits, etc.

DISEASE

- A disease can be defined as any condition that may lead to discomfort, distress, health problems, or death of the affected person.
- It may be due to defective heredity, inappropriate diet, disturbed metabolism or pathogenic attack.
- A person is said to be disease free, if there is no discomfort or derangement of the functioning of the body.

Difference between a healthy and a disease-free state of human body

Healthy	Disease-free
It is the state of complete physical, mental and social well-being.	It is the state of absence of discomfort or derangement.
It depends on both the individual as well as physical and social environment.	It is related to the individuals only.
A healthy individual is disease free as well.	A disease free individual can be healthy or unhealthy.

Causes of Diseases

Causes of diseases are basically agents and factors that produce diseases in body. Although, there can be a number of causes for a disease, they can be broadly divided into **immediate** causes and **contributory** causes.

(i) Immediate causes: It is the primary cause of the disease. Hence, it is also known as first level of cause. It includes external agents like micro-organisms.
Organisms like virus, bacteria, and other micro-organisms can cause diseases in a person. Suppose an individual is suffering from diarrhea. The immediate or the first level of cause is the pathogen which may be viral or bacterial infection.

(ii) Contributory causes: Even though a virus can be the immediate cause of a disease, other associated causes might allow the entry of the virus into the body. These causes are known as **contributory causes.**

These include the following conditions:

- **Unhealthy condition:** Infectious agents like virus and bacteria enter the body through contaminated food or water. Thus, the consumption of contaminated food or water can be another cause of disease.
- **Improper public service:** The lack of proper public service is the main reason for the lack of clean drinking water and food.
- **Poverty:** Lack of nourishment can also lead to the occurrence of diseases in a person.

Types of Diseases

Diseases are broadly classified into two categories:

(a) Congenital diseases: These are diseases which are present since birth. *For instance,* hole in the heart of an infant. They are caused by some genetic abnormalities or metabolic disorder or malfunctioning of an organ.

(b) Acquired diseases: These are diseases which may occur after birth during one's lifetime.

Based on their ability or inability to spread from one individual to another, acquired diseases are of two types:

(i) **Infectious or Communicable diseases:** The diseases which can be transmitted from diseased person to healthy person by means of infectious agents are known as infectious or communicable diseases. For example, tuberculosis, measles, malaria etc.

(ii) **Non-infectious or Non-communicable diseases:** The diseases which cannot be transmitted from an affected individual to a healthy person are known as non-infectious or non-communicable diseases. For example, high blood pressure, Cancer, Allergy, Obesity etc.
Non-infectious diseases are not caused by any pathogen or living organism. They are mostly due to internal or intrinsic non-infectious causes. For example, High blood pressure is caused due to lack of exercise or excessive weight.Similarly, Cancer is caused due to genetic abnormalities.

Difference table between Infectious (Communicable) and Non-infectious (Non-communicable) diseases

Infectious (Communicable) Diseases	Non-infectious (Non-communicable) diseases
It can be transmitted from diseased person to healthy person.	It cannot be transmitted from one person to another.
They are caused by attack of pathogens *i.e*. external agents or factors.	They are caused by factors other than living pathogens i.e. caused by internal factors, such as deficiency of nutrients, genetic abnormalities etc.
Transmission of disease occurs through direct contact or some medium (water, food, air etc).	Transmission of disease by contact is absent.
Examples: Malaria, Cholera, Tuberculosis	Examples: Diabetes, Cancer, Obesity etc.

Non-infectious diseases are further classified as:

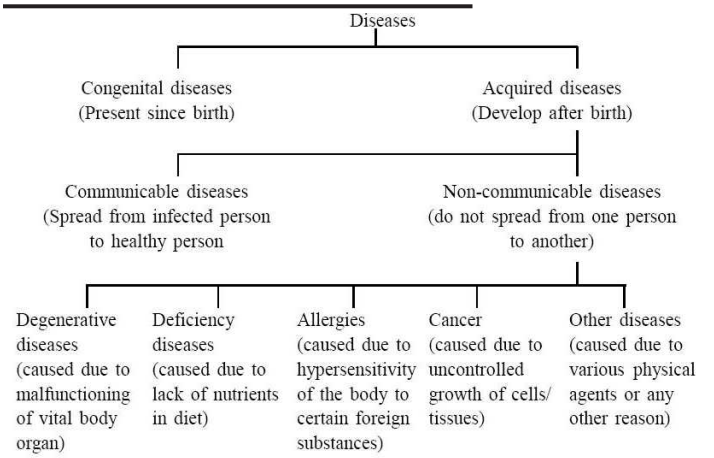
(i) **Degenerative diseases:** The diseases caused by the malfunction of some vital organs of the body. E.g. heart failure.

(ii) **Deficiency diseases:** These are caused due to nutritional deficiency such as that of minerals or vitamins in the diet. E.g. Anaemia (due to deficiency of B_{12}), Beri- beri (due to deficiency of vitamin B).

(iii) **Allergies:** These are caused due to hypersensitivity of the body to certain foreign substances.

(iv) **Cancer:** This is an abnormal, uncontrolled and unwanted growth of cells. E.g. Breast cancer, leukemia

Classification of Human Diseases



Impotant Terms:

- **Pathogens:** Pathogens are disease causing organisms. They enter the human body through various means, then multiply; interfere with normal vital activities and causes harm to the human body.
- **Parasites** are pathogens as they harm the host by living in or on them.

Common Infectious Diseases in Man

1. Bacterial diseases

(a)Typhoid:

- Pathogen**:** ***Salmonella typhi.***
- **Organ affected:** Small intestine, migrate to other organs through blood.
- **Mode of transmission:** It spreads through food and water and migrates to other organs through blood.
- **Symptoms:**
  - ➢ Continuous fever, headache, and slow pulse rate.
  - ➢ Reddish rashes appear on the upper abdomen.
  - ➢ Diarrhoea which becomes haemorrhagic (loss of blood)
- Widal test is used for confirmation of the disease.

(b) Pneumonia:

- **Pathogen:** ***Streptococcus pneumonia*** **and** ***Haemophilus influenza.***
- **Organs affected:** Alveoli of lungs, alveoli get filled with fluid.
- **Mode of transmission:** It spreads by the sputum of the infected person.
- **Symptoms:**
  - ➢ Infects lung alveoli. The alveoli get filled with fluid leading to respiratory problems.
  - ➢ Fever, chills, cough, headache.
  - ➢ In severe cases, lips and finger nails turn grey to bluish colour.

2. Viral diseases

Common cold:

- **Pathogen: *Rhinoviruses.***
- **Organs affected**: Nose and respiratory passage
- **Mode of transmission:**It is an air-borne disease that spreads by inhaling droplets resulting from cough or sneezes. It is also transmitted through contaminated objects.
- **Symptoms:**
  - ➢ **It i**nfects nose and respiratory passage.
  - ➢ Nasal congestion and discharge, sore throat, hoarseness, cough, headache, tiredness etc.
  - ➢ The disease Last for 3-7 days.

3. Protozoan diseases

(a) Malaria:

- **Pathogen: *Plasmodium sp.*** *(P. vivax, P. malariae,* and *P. falciparum).*
- **Organs affected**: Liver and RBC.
- **Mode of transmission:** It is a vector borne disease that spreads by biting of the female Anopheles mosquito.
- **Symptoms:**
  - ➢ Headache, nausea and muscular pain
  - ➢ Feeling of chill and shivering followed by fever recurring every 3-4 days.
  - ➢ Patient becomes weak, exhausted and anaemic.
  - ➢ The malaria may secondarily cause enlargement of liver and spleen.

Life cycle of Plasmodium

- Life cycle of plasmodium starts with inoculation of **sporozoites** (infective stage) through the bite of infected female *Anopheles* mosquitoes.
- The parasite initially multiplied within the liver cells and then attack the red blood cells (RBCs) resulting in their rupture.
- There is release of a toxic substance called **hemozoin** from the ruptured RBCs which responsible for the **chill and high fever**.
- From the infected human the parasite enters into the body of Anopheles mosquito during biting and sucking blood.
- Further development takes place in the body of Anopheles mosquitoes.
- The female mosquito takes up **gametocytes** with the blood meal.
- Formation of gametes and fertilization takes place in the intestine of mosquito.
- The zygote develops further and forms thousands of sporozoites which migrated into the salivary gland of mosquito.
- When the mosquito bite another human sporozoites are injected.
- The malarial parasite requires two hosts – human and Anopheles, to complete their life cycle.

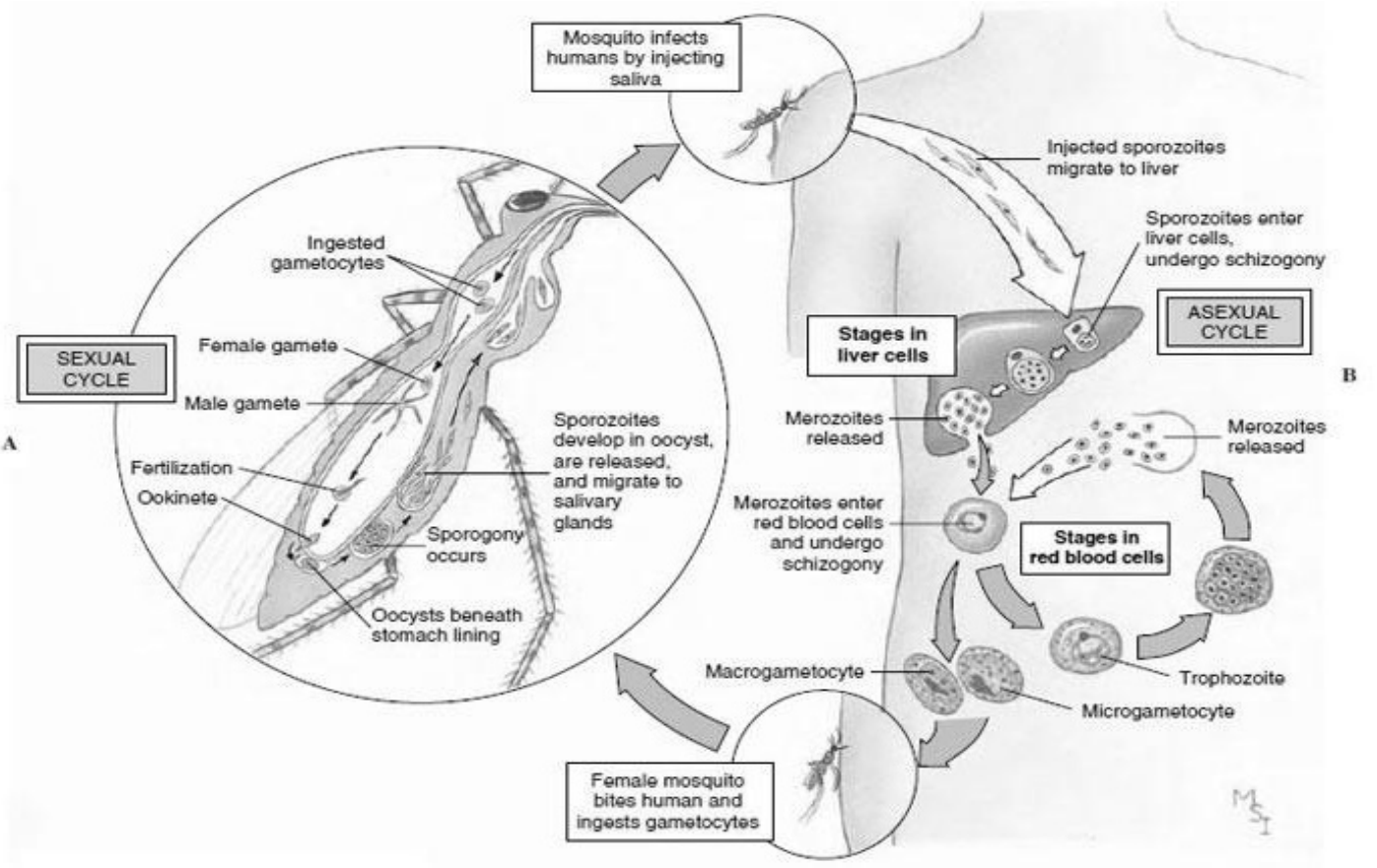


Fig. Stages in the life cycle of *Plasmodium*

(b) Amoebiasis (Amoebic dysentery):

- **Pathogen:** ***Entamoeba histolytica.***
- **Organs affected:** large intestine of man.
- **Mode of transmission:** It is a vector-borne disease that spreads by means of contaminated food and water. The vector involved in the transmission of disease is houseflies (mechanical carriers).
- **Symptoms:**
  - ➢ Formation of ulcers in intestine.
  - ➢ Feeling of abdominal pain and nausea.
  - ➢ Acute diarrhea and mucus in stool.

4. Helminth Diseases

(a)Ascariasis:

- **Pathogen:** ***Ascaris*** (Intestinal parasite).
- **Organs affected:** Intestine of man.
- **Mode of transmission:** It spreads via contaminated food and water containing eggs of parasites.
- **Symptoms:** Internal bleeding, muscular pain, fever, anaemia and blockage of intestinal passage.

(b) Filariasis (Elephantiasis):

- **Pathogen: Filarial worms or *Wuchereria*** *(W. bancrofti and W. malayi).*
- **Organs affected:** Lymphatic vessels of the lower limbs, genital organs.
- **Mode of transmission:** Bite of female *Culex* mosquito.
- **Symptoms:**
  - ➢ Fever
  - ➢ Collection of endothelial cells and metabolites in the wall of lymph vessels.
  - ➢ Swelling of legs which appear as legs of elephant, so this disease is also called elephantiasis.

5. Fungal diseases

(a) Ring worms:

- Pathogens are ***Microsporum, Trichophyton*** and ***Epidermophyton.*** They are seen in groin, b/w toes, etc.
- **Organs affected**: Skin, nails, folds of skin, groin.
- **Mode of transmission:** From soil or by using towels, cloths, comb etc. Heat and moisture help fungi to grow.
- **Symptoms:** Appearance of dry, scaly lesions on various body parts such as skin nails and scalp. Intense itching.

Other Infectious Diseases

Bacterial Diseases

Disease	Pathogen	Transmission
Dysentery	*Shigella*	Contact, Contaminated food and water
Plague	*Pasteurellapestis*	Rat fleas
Diphtheria	*Corynebacterium diphtheriae*	Contaminated food, Direct contact
Cholera	*Vibrio cholerae*	Food and water contaminated with faeces
Tuberculosis	*Mycobacterium tuberculosis*	Droplets from patient or carrier
Tetanus	*Clostridium tetani*	Contamination of wound by bacteria
Whooping cough	*Bordetella pertussis*	Contact, Droplets
Leprosy	*Mycobacterium leprae*	Direct contact
Anthrax	*Bacillus anthrasis*	Contact with cattle
Weil's disease	*Leptospira*	Contact with rodents, dogs etc.

Viral Diseases

Disease	Pathogen	Transmission
Rabies	Rabies virus	Rabid dogs etc
Dengue	Dengue virus	Aedes mosquito
Influenza	Influenza virus	Coughing & sneezing
Measles	Rubeola virus	Droplets
German measles	Rubella virus	Close contact
Mumps	Mumps virus	Air borne droplets
Chicken pox	Varicella zoster	Air borne droplets
Small pox	Variola virus	Direct contact
Polio	Polio virus	Faeces and Air
Chikungunya	Chikungunya (CHIK) Virus	Aedes mosquito
Avian flu	H5N1 virus	Contact with infected poultry. Air borne spread
H1N1(Swine flu)	H1N1 virus	Contact with pigs, cough & sneeze of infected person.

Prevention and Control of Diseases

(i) Personal hygiene: This measure includes maintaining a clean body, consumption of healthy and nutritious food, drinking clean water etc.

(ii) Public hygiene

- ➢ Proper disposal of wastes and excreta.
- ➢ Periodic cleaning and disinfection of water reservoirs, pools, cesspools and tanks.
- ➢ Standard practices of hygiene in public catering.

(iii) Vector eradication: Various diseases such as malaria, Filariasis, dengue and Chinkungunya spread through vectors. Thus, these diseases can be prevented by providing a clean environment and by preventing the breeding of mosquitoes. This can be achieved by:

- ➢ Avoid stagnation of water.
- ➢ Regular cleaning of household coolers.
- ➢ Use of mosquito nets.
- ➢ Introduce larvivorous fishes like *Gambusia*in ponds.

- ➢ Spraying insecticides in ditches, drainage and swamps.
- ➢ Doors and windows should be provided with wire mesh to prevent entry of mosquitoes.

(iv) To prevent air borne diseases

- ➢ Stay away from the diseased person.
- ➢ Wear a mask when you need to contact a diseased person.
- ➢ Cover your mouth and nose while coughing or sneezing to prevent the spread of the disease.

Immune System

- It is the system that gives immunity to the body by recognizing, responding and remembering foreign antigens.
- It plays an important role in allergic reaction, auto-immune disease and organ transplantation. It includes lymphoid organs, tissues, cells and soluble molecules like antibodies.

Lymphoid Organs

These are the organs where origin, maturation and proliferation of lymphocytes occur. It is of two types.

(a) Primary lymphoid organs

- Here, the production and maturation of lymphocytes take place. The immature lymphocytes differentiate into antigen-sensitive lymphocytes.
  E.g. Bone marrow and thymus.
  - ➢ **Bone marrow** is the site of formation of blood cells.
  - ➢ **Thymus** is a bilobed organ located near the heart beneath the breastbone. It is large during birth but gradually reduces in size and becomes very small size in puberty.
  - ➢ B-lymphocytes are produced and matured in bone marrow.
  - ➢ T-lymphocytes are produced in bone marrow but mature in thymus.

(b) Secondary lymphoid organs

- It is the site where proliferation and differentiation of lymphocyte takes place. The matured lymphocytes migrate to these organs, interact with the antigens and then proliferate to become **effector cells.**
  E.g. Spleen, lymph nodes, tonsils, Peyer'spatches MALT and appendix.
  - ➢ **Spleen:** It is a bean-shaped organ, which contains lymphocytes and phagocytes. It acts as a filter of the blood by trapping blood-borne micro-organisms. T removes worn-out RBCs and microorganisms from blood. It is a reservoir of erythrocytes in foetus.
  - ➢ **Lymph nodes:** It is a small solid structure located at different points along the lymphatic system. They trap microorganisms or other antigens. The antigen trapped into the lymph node is responsible for activation and differentiation of lymphocytes and cause immune response.
  - ➢ **Mucosal associated lymphoid tissue (MALT):** It is located within the lining of respiratory, digestive and urinogenital tracts. It constitutes 50% of lymphoid tissue.

Immunity

Immunity is the ability of body to protect itself from infection and disease. The immune response varies from person to person. This is why; some people are more sensitive or prone to infection than other.

For example, if a child has suffered from small pox once, then there is almost no chance of him suffering from it again. This happens because, when the immune system of the body encounters a virus or an antigen for the first time, it reacts against it and remembers it. Therefore, when the virus enters the body for a second time, the immune system reacts more strongly to prevent chances of suffering from the disease again. Therefore, it can be concluded that if we infect the body of a person with something that mimics the microbe, then the immune system will remember it and will prevent the actual disease-causing microbe from causing any disease.

On the basis of immunity possessed by the body, Immunity is ***divided into two types: Innate and Acquired.***

1. Innate (non-specific) immunity

- It is the non-specific type of defence that is present at the time of birth. They are called the first line of defense.
- It provides barriers to the entry of foreign agents into our body.
- ***It consists of four types of barriers.***
  - **(i) Physical barriers:** *E.g.* Skin and Mucous coating of the respiratory, gastro-intestinal and urino-genital tracts prevent the entry of microbes into the body.
  - **(ii) Physiological barriers:** E.g.Hydrochloric acid in stomach, saliva in mouth, Lysozyme in tears, saliva and snotetc.
  - **(iii) Cellular barriers:** *E.g.* Polymorpho-nuclear leukocytes (PMNL-neutrophils), macrophages, and natural killer cells in the blood and tissues kill pathogen by phagocytosis.
  - **(iv) Cytokine barriers:** Virus infected cells secrete proteins called interferon which protect non-infected cells from spread of viral infection.

2. Acquired (specific) immunity

- It is pathogen specific immunity.
- *Acquired immunity has following unique features:*
  - **(i) Specificity:** It helps to distinguish specific foreign molecules.
  - **(ii) Diversity:** It recognizes vast variety of foreign molecules.
  - **(iii) Discrimination between self and non-self**: It is able to recognize and respond to molecules that are foreign or non-self. It will not respond to our own cell or molecules.
  - **(iv) Memory**: When a pathogen for the first time infects a person; it produces primary immune response which is of low intensity. When the same pathogen attacks again, highly intensified secondary (anamnestic) response is generated, thereby preventing the occurrence of disease.

- The primary and secondary immune responses are carried out with *B-lymphocytes* and *T-lymphocytes*.
  - **(i) B-lymphocytes (B-cells):** The B-lymphocytes produce a group of proteins in response to pathogen into the blood to fight with them called **antibody.**
  - **(ii) T-lymphocytes:** They help B-cells to produce antibodies.

Difference between innate immunity and acquired immunity

Innate immunity	Acquired immunity
It is a non-pathogen specific type of defense mechanism.	It is a pathogen specific type of defense mechanism.
It is inherited from parents and protects the individual since birth.	It is acquired after the birth of an individual
It operates by providing barriers against the entry of foreign infectious agents.	It operates by producing primary and secondary responses, mediated by B-lymphocytes and T-lymphocytes
It does not have specific memory.	It is characterised by an immunological memory.

Structure of an Antibody Molecule

- Each antibody has four polypeptide chains: Two small light chains and two larger heavy chains (H_2L_2).

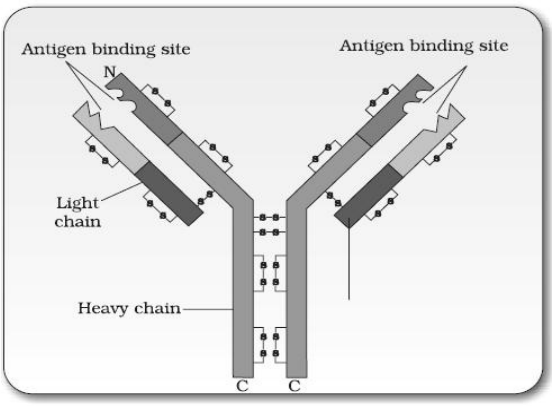


Fig. Structure of an antibody molecule

- Different types of antibodies produced in our body are: IgG, IgA, IgM, IgE andIgD.

Acquired immune response is further divided into two types.

1. **Humoral or Antibody mediated response/Antibody mediated immunity (AMI):**
   - ➢ Immune response by the B-cells by production of antibody is called **Antibody mediated immune response** or **humoral immune response. Here, a**ntibodies are found in blood plasma. So, called as humoral immune response.
2. **Cell-mediated response/cell-mediated immunity (CMI):**
   - ➢ Immune response by T-lymphocytes (T-cells) is by activation of cytotoxic killer cells which detects and destroys the foreign cells and also a cancerous cell is called cell mediated immune response.
   - ➢ CMI causes rejection of graft.
   - ➢ The body is able to differentiate 'self' and 'non-self'.
   - ➢ Tissue matching and blood group matching are essential before undertaking any graft or transplant. After this, the patient has to take immune-suppressants all his life.

Active immunity and Passive immunity

1. **Active immunity:** It is a type of acquired immunity in which the body produces its own antibodies against disease-causing antigens. It is a slow process but has long lasting effect. It is produced by two ways:
   - **(a) Natural active immunity:** During natural infection by microbes.
   - **(b) Artificial active immunity:** Injecting the microbes deliberately during immunization.
2. **Passive immunity:** It is a type of acquired immunity in which readymade antibodies are transferred from one individual to another. It is fast and provides immediate relief.
   It is produced by two ways:
   - **(a) Natural passive immunity:** *E.g.*
     - ➢ Antibodies (IgG) from mother → Placenta → Foetus
     - ➢ Antibodies (IgA) in colostrum → infants
   - **(b) Artificial passive immunity:** *E.g.* Anti-tetanus serum (ATS)

Difference between active immunity and passive immunity

Active immunity	Passive immunity
It is a type of acquired immunity in which the body produces its own antibodies against disease-causing antigens.	It is a type of acquired immunity in which readymade antibodies are transferred from one individual to another.
It has a long lasting effect.	It does not have a long-lasting effect.
It is slow. It takes time in producing antibodies and giving responses.	It is fast. It provides immediate relief.
E.g. Injecting microbes through vaccination inside the body.	*E.g.* Transfer of antibodies present in the mother's milk to the infant.

Immunization and Vaccination

- *Vaccination* may be defined as protection of the body from communicable diseases by the administration of some agents that mimic the microbe.
- The agent can be a suspension of killed or attenuated microbes, or a substance that mimics the disease-causing microbes. This is known as a *vaccine.*
- Vaccines protect humans and other animals from several diseases such as Cholera, Typhoid, Tuberculosis, Hepatitis, Chicken pox, Measles, Polio, and Small pox.
- This is based on 'memory' of the immune system.
- It is of two types: Active immunization and passive immunization.

1. **Active immunization (Vaccination)**
   - ➢ In this, a preparation of **vaccine** (antigenic proteins of pathogen or inactivated pathogen) is introduced into body.
   - ➢ The antibodies produced in the body against the antigens neutralize the pathogenic agents during actual infection.
   - ➢ The vaccines also generate memory B and T-cells that recognize the pathogen quickly.
   - ➢ E.g. Polio vaccine, Hepatitis B vaccine, DPT vaccine etc.
   - ➢ Vaccines are produced using DNA recombinant technology (E.g. Hepatitis B vaccine produced from Yeast).
2. **Passive immunization**
   - ➢ It is the direct injection of pre-formed antibodies or antitoxin when quick immune response is required *E.g.* Immunization against Tetanus, snake venom, etc.

Allergies

- Allergy is the exaggerated response of the immune system to certain antigens present in the environment.
- The substances two which such immune response is produced is known as allergen. *E.g.* mites in dust, pollens, animal dander, fur, etc.
- Antibodies produced against the allergens are of IgE type.
- **Symptoms:** Sneezing, watery eyes, running nose, difficulty in breathing, etc.
- Allergy is due to the release of chemicals like histamine and serotonin from the mast cells.
- To determine the cause of allergy, the patient is exposed to or injected with very small doses of possible allergens, and the reactions studied.
- Drugs like *anti-histamine*, *adrenaline* and *steroids* quickly reduce the symptoms of allergy.
- Modern-day life style results lowering of immunity and more sensitivity to allergens.
- Asthma is the respiratory disease due to allergy.

Autoimmunity

It is the memory based acquired immunity, which is able to distinguish foreign molecules or cells (pathogen) from self-cells. Sometimes due to genetic and other unknown reasons the body attacks self-cells. This results in damage to the body cells and is called auto-immune disease. *E.g.* **Rheumatoid arthritis**, **Multiple sclerosis**

AIDS (Acquired Immuno Deficiency Syndrome)

- The word "immuno deficiency" signifies that the immune system becomes very weak. It is a disorder of cell-mediated immune system of the body.
- Lymphocytes are the main cells of the immune system *i.e.* T-lymphocytes and B-lymphocytes.'Helper T' lymphocytes play a great role in regulating the immunesystem. Damages to or destruction of 'Helper' lymphocytes lead to the developmentof a cellular immune deficiency which makes the patient susceptible to wide variety of infections
- Syndrome is a group of symptoms, signs, physical or physiological disturbances that are due to a common cause.
- AIDS is considered as a syndrome because it is a complex of diseases and symptoms which develop due to failure of immune system of the body. HIV that causes AIDS damages the immune system of patient. As a result, even a small cold leads to pneumonia; a minor infection leads to severe diarrhoea and blood loss and simple skin rashes develop into ulcers.
- AIDS is the deficiency of immune system that is acquired during life time.
- AIDS was first reported in America in 1981.

  Pathogen: It is caused by **HIV (Human Immuno Deficiency Virus),** a **retrovirus** having RNA genome.

Mode of transmission

- ➢ Unprotected sexual contact with infected person.
- ➢ Transfusion of contaminated blood and blood products from an infected person to a healthy.
- ➢ Sharing of infected needles and syringes.
- ➢ From infected mother to her child through placenta.

High risk of getting this infection includes

- ➢ Individuals with multiple sexual partners
- ➢ Drug addicts who take drugs intravenously
- ➢ Individuals who require repeated blood transfusion
- ➢ Children born to an HIV infected mother

- HIV does not spread by mere touch or physical contact; it spreads only through body fluids.
- There is a time-lag (from a few months to many years i.e. 5-10) between the infection and appearance of symptoms.

Life cycle of HIV:

- ➢ AIDS is caused by HIV via sexual or blood-blood contact.
- ➢ After entering the human body, the HIV virus attacks and enters the macrophages. Inside the macrophages, the RNA of the virus replicates with the help of enzyme reverse transcriptase and give rise to viral DNA.
- ➢ Then, this viral DNA incorporates into the host DNA and directs the synthesis of virus particles.
- ➢ At the same time, HIV enters the helper T-lymphocytes. It replicates and produces viral progeny here. These newly formed progeny viruses get released into the blood, attacking healthier helper T-lymphocytes in the body.
- ➢ As a result, the number of T-lymphocytes in the body of an infected person decreases progressively, thereby decreasing the immunity of the body.

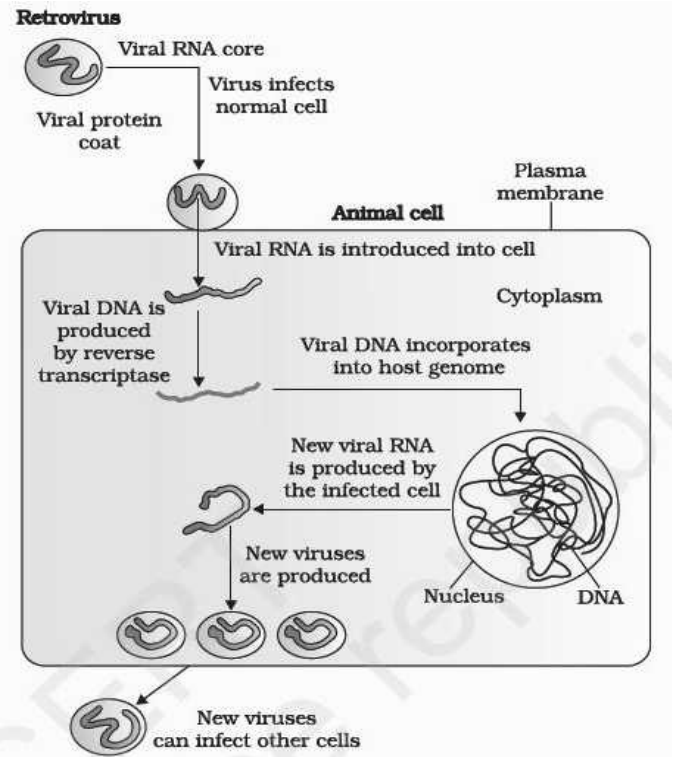


Fig. Replication of retrovirus

- HIV infected person may be infected with *Mycobacterium*, viruses, fungi and even parasites like *Toxoplasma.*
- **Diagnosis:** ELISA test (Enzyme-linked immune-sorbent Assay).
- **Treatment:** No medicine or vaccine is known to be available against HIV infection. AIDS has no cure, prevention is the best option.

  Prevention of AIDS:
  - ➢ Educate peoples about AIDS.
  - ➢ Use safe blood for transfusion.
  - ➢ Use of disposable needles and syringes.
  - ➢ Advocating safe sex and free distribution of condoms.
  - ➢ Controlling drug abuse.
  - ➢ Regular check-ups for HIV in susceptible population.

Facts about HIV transmission

- HIV is a weak virus and hard to get infected with. It cannot be transmitted through air or water outside the human body.
- A person cannot get AIDS by hugging or sneezing of an infected person, insect bites (including mosquito), sharing the same comb, plates, glass, handkerchiefs, knives or cutlery.
- A person cannot get AIDS by using public toilets, swimming pools, showers and telephones.
- HIV does not transmit by being near to someone, touching someone or working with someone who is suffering from AIDS.

Cancer

- Cancer is an abnormal and uncontrolled multiplication of cells resulting in the formation of tumor.
- Cancerous cells appear to have lost the property of **contact inhibition**.
- They just continue to divide giving rise to masses of cell called **tumors.**
- **Tumors are of two types:**
  - ➢ **Benign tumors:** They remain confined to the place of its origin. Hence, they cause little damage.
  - ➢ **Malignant tumors:**They are the mass of proliferating cells called neoplastic or tumor cells. These cells grow very rapidly and invade and damage surrounding tissues.
- **Metastasis:** Metastasis is the pathological process of spreading cancerous cells to the different part of the body. It is exhibited by malignant tumors. These cells divide uncontrollably, forming a mass of cells called tumor. From the tumor, some cells get sloughed off and enter into the blood stream. From the blood stream, these cells reach distant parts of the body and therefore, initiate the formation of new tumors by dividing actively.

Types of cancer

- ➢ **Carcinoma:** It is a cancer of epithelial cells
- ➢ **Sarcoma:** It is a cancer of connective tissues.
- ➢ **Melanomas:** It is a cancer of melanocytes.
- ➢ **Leukemia:** It is a blood cancer.
- ➢ **Lymphomas:** It is a cancer of spleen and lymph nodes.

Difference between normal cells and cancerous cells

Normal cell	Cancerous cell
Normal cell show the property of contact inhibition. Therefore, when these cells come into contact with other cells, they stop dividing.	Cancerous lack the property of contact inhibition. Therefore, they continue to divided, thereby forming a mass of cells or tumor.
They undergo differentiation after attaining a specific growth.	They do not undergo differentiation.
These cells remain confined to a particular location.	These cells do not remain confined to a particutlar location. They move into neighbouring tissue and disturb their functions.

Causes of cancer (Carcinogens)

- The agents which causes cancer is known as carcinogens. The normal cells are transformed into cancerous neoplastic cells by physical, chemical and biological agents.
- **Physical agents:** *E.g.* Ionizing radiations like X-rays and gamma rays and non-ionizing radiations like UV.
- **Chemical agents:** Tobacco smoke (major cause of lung cancer), vinyl chloride, caffeine, nicotine, mustard gas etc.
- Biological agents: *E.g.* oncogenic viruses, cellular oncogenes (c-onc or proto oncogenes) etc. When C-onc (in normal cells) is activated the cells becomes oncogenic.

Cancer detection and diagnosis

- Biopsy and histopathological study of the tissue:In this, a thin piece of the suspected tissue is stained and examined under microscope. E.g.In case of leukemia, biopsy and histopathological studies is done. It involves the test of blood and bone marrow for increased cell counts.
- Radiography (use of X-rays)
- CT (Computerized tomography) scan
- MRI (Magnetic Resonance Imaging).
- Use of Antibodies against cancer-specific antigens.
- Techniques of molecular biology to detect genes related to cancer. Such individuals may be advised to avoid exposure to particular carcinogens (*e.g.* tobacco smoke).

Treatment of cancer

- Radiation therapy: Tumor cells are irradiated lethally, without damaging surrounding normal tissues.
- Chemotherapy: Use of chemotherapeutic drugs. Many drugs have side effects like hair loss, anaemia etc.
- Immunotherapy: The patients are given biological response modifiers (*e.g.* α- interferon) which activates their immune system and helps in destroying the tumor.
- Surgery.
- Most cancers are treatedby combination of surgery, radiotherapy and chemotherapy.

DRUGS AND ALCOHOL ABUSE

A. Drugs

1. **Depressants:** They depress brain activity. They include
   - **Sedatives:** Sedatives give calmness and relaxation to body. Their high doses induce sleep. *E.g.* Barbiturates (sleeping pills).
   - **Tranquilizers:** They lower the tension and anxiety without inducing sleep. *E.g.* Benzodiazephines (*e.g.* Valium).
2. **Opiate narcotics (pain killers):**
   - These are the drugs which bind to specific opioid receptors in central nervous system and gastrointestinal tract.
   - They are analgesic and depressant. They lower the tension, anxiety, blood pressure, respiration rate and reduce visual activity.

     E.g. Opium and its derivatives (Opiates or Opioids): Opium is obtained from dried latex of unripe capsules of Poppy plant *(Papavar somniferum)***.**

Opium derivatives

- **Morphine:** They are strong analgesic and sedative extracted from the latex of poppy plant. They are useful during surgery.

Brown sugar

- **Heroin: Heroinis** commonly called **smack**, and chemically **diacetylmorphine.** It is the most dangerous, white, odourless, bitter crystalline compound produced by acetylation of morphine. It is a depressant and slows down body functions. It is consumed by snorting or injection.
- **Codeine:** They are mild analgesic and used in cough syrups.

3. **Stimulants**
   - They stimulate central nervous system.
   - *E.g.* Cocaine, Caffeine (cardiac stimulant), amphetamines.
   - Amphetamines andanabolic steroids are misused by some athletes.

Coca alkaloid (Cocaine or coke/crack):

- They are obtained from ***coca plant, Erythroxylumcoca.***
- It interferes with the transport of neurotransmitter dopamine.
- Cocaine is commonly called as **coke** or **crack** is usually snorted.
- It stimulates central nervous system producing euphoria and increased energy.
- Its excessive dosage causes hallucination.

4. **Hallucinogens:**
   - They cause colourful hallucinations, change thoughts, feelings and perceptions.

     E.g. Mescaline, Psilocybin, Cannabinoids and **LSD (Lysergic Acid diethylamide).**
   - ***Atropa belladonna*** **and** ***Datura*** are plants with hallucinogenic property.

Cannabinoids:

- Cannabinoids are drugs that interact with cannabinoid receptors in brain.
- They are generally taken by inhalation and oral ingestion.
- Natural cannabinoids are obtained from ***Cannabis sativa*** (Hemp plant). Its flower tops, leaves and resin are used to produce ***bhang, ganja, charas (hashish), marijuana*** etc.
- It affects cardiovascular system.

B. Alcoholism

- Alcohols include,
  - ➢ **Beverages:** Wine, beer and toddy (5-15% alcohol).
  - ➢ **Spirits:** Whisky, brandy, rum, gin, arrack etc. (more than 50% alcohol).
- The victims of alcoholism are known as ***alcoholics.***

Effects of alcoholism

On the individual: Alcohol has an adverse effect on the body of an individual.

- It affects thinking ability, speech, movements, reflexes etc.
- It causes amnesia, blurred vision, loss of body balance, nausea, vomiting, headache etc.
- Cirrhosis and fatty liver.
- Alcoholic polyneuritis and loss of appetite
- Cardiovascular diseases and hypertension.
- Ulcer, pancreatitis and gastritis.

- Loss of sexual drive and necrospermia.
- Foetal alcohol syndrome (FAS or Alcohol Embryopathy).

Effect on the family:

- Consumption of excess alcohol by any family member can have devastating effects on the family.
- It leads to several problems such as quarrels, frustrations, insecurity etc.

Effects on the society:

- Rash behaviour
- Malicious mischief and violence
- Deteriorating social network
- Loss of interest in social and other activities.
- Effects of alcoholism on traffic accidents
- Affects co-ordination and correct judgment of distance
- Affects vision; often causes Tunnel vision
- Increases reaction time
- Affects behaviour

C. Tobacco/Smoking

- Tobacco is smoked, chewed or used as a snuff.
- Tobacco contains nicotine, an alkaloid, which stimulates adrenal gland to release adrenaline and nor-adrenaline, causing high blood pressure and increased heart rate.
- Smoking causes cancers of lung, urinary bladder and throat, bronchitis, emphysema, coronary heart disease, gastric ulcer etc. Tobacco chewing causes oral cancer.
- Smoking also increases carbon monoxide content in blood and reduces oxyhaemoglobin. This causes oxygen deficiency in the body.

ADOLESCENCE AND DRUGS

- **Adolescence:** It is 'a period' and 'a process' during which a child becomes mature in terms of his/her attitudes and beliefs for effective participation in society.
- It is a bridge linking childhood and adulthood (period of 12-18 years of age). It is very vulnerable phase of mental and psychological development.

Common causes of drug/alcohol use in Adolescence period:

- Curiosity and Experimentation.
- Need for adventure and excitement.
- To escape facing problems.
- Stress from pressure to excel in academics or examination.
- Television, movies, newspapers, internet etc.
- Unstable or unsupportive family structures and peer pressure.

Addiction and dependence

- Addiction is a psychological attachment to certain effects such as euphoria and a temporary feeling of well-being associated with drugs and alcohol.
- 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.**
- Dependenceis the tendency of the body to manifest a characteristic and unpleasant withdrawal syndrome if regular dose of drugs/alcohol is abruptly discontinued. This results in anxiety, shakiness, nausea and sweating.
- Dependence leads to social adjustment problems.

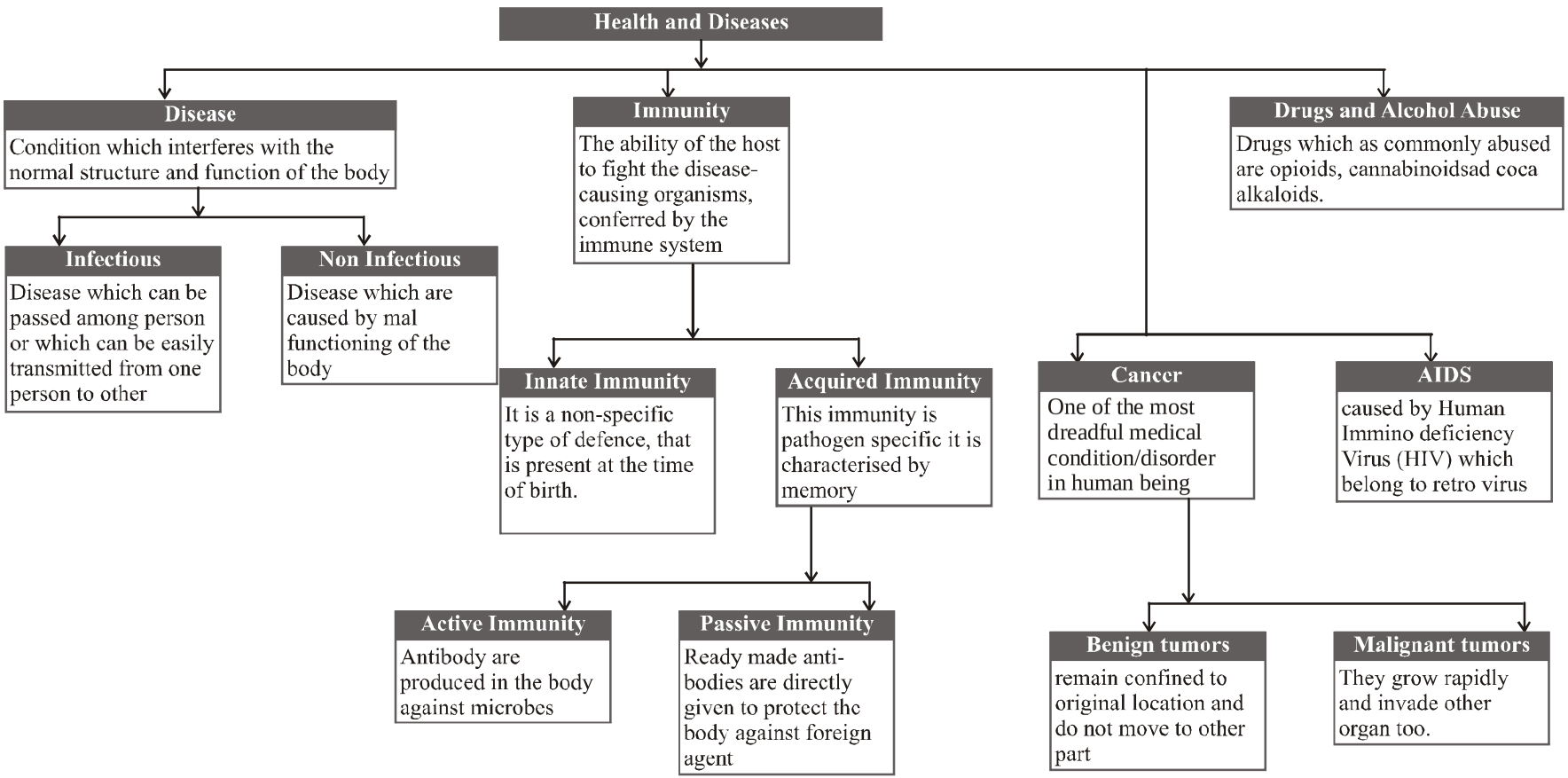
Effects of drug/alcohol abuse

An individual who is addicted to drugs creates problems not only for himself but also for his family.

- **On individual:** Drugs have an adverse effect on the central nervous system of an individual. This leads of malfunctioning of several other organs of the body such as kidney, liver etc. The spread of HIV is most common in these individuals as they share common needles while injecting drugs in their body. Drugs have long term side effects on both male and females. These side effects include increased aggressiveness, mood swings and depression. Use of drugs and alcohol by pregnant woman adversely affect the foetus.
- **On family and society:** People addicted to drugs create problems for his family and society. A person dependent on drugs becomes frustrated, irritated, and anti-social.
- Warning sign of drug and alcohol abuse among youth include:
- Drop in academic performance and absence from school.
- Lack of interest in personal hygiene.
- Withdrawal and isolation.
- Depression, fatigue, aggressive and rebellious behaviour, deteriorating relationship between family and friends.
- Loss of interest in hobbies.
- Fluctuations in sleeping, eating habits, weight, appetite etc.

Prevention and control

- Avoid undue peer pressure.
- Education and counselling.
- Seeking help from parents and peers.
- Looking for danger signs.
- Seeking professional and medical help.
  - ➢ Psychologists and psychiatrists.
  - ➢ De-addiction and rehabilitation programmes.


Health and Diseases
Disease
Condition which interferes with the normal structure and function of the body
Infectious
Disease which can be passed among person or which can be easily transmitted from one person to other
Non Infectious
Disease which are caused by mal functioning of the body
Immunity
The ability of the host to fight the disease-causing organisms, conferred by the immune system
Innate Immunity
It is a non-specific type of defence, that is present at the time of birth.
Acquired Immunity
This immunity is pathogen specific it is characterised by memory
Active Immunity
Antibody are produced in the body against microbes
Passive Immunity
Ready made anti-bodies are directly given to protect the body against foreign agent
Drugs and Alcohol Abuse
Drugs which as commonly abused are opioids, cannabinoidsad coca alkaloids.
Cancer
One of the most dreadful medical condition/disorder in human being
AIDS
caused by Human Immino deficiency Virus (HIV) which belong to retro virus
Benign tumors
remain confined to original location and do not move to other part
Malignant tumors
They grow rapidly and invade other organ too.

EXERCISE - 1
Conceptual Questions

1. Common cold is not cured by antibiotics because it is:
(a) caused by a virus.
(b) caused by a Gram-positive bacterium.
(c) caused by a Gram-negative bacterium.
(d) not an infectious disease.

2. Select the correct statement with respect to diseases and immunisation?
(a) If due to some reason B-and T-lymphocytes are damaged, the body will not produce antibodies against a pathogen.
(b) Injection of dead / inactivated pathogens causes passive immunity.
(c) Certain protozoans have been used to mass produce hepatitis B vaccine.
(d) Injection of snake antivenom against snake bite is an example of active immunisation.

3. Which one of the following conditions though harmful in itself, is also a potential saviour from a mosquito borne infectious disease ?
(a) Leukemia (b) Thalassemia
(c) Sickle cell anaemia (d) Pernicious anaemia

4. Take the odd one out
(a) Rabies, Influenza, AIDS
(b) Amoebiasis, Giardiasis, Trypanosomiasis
(c) Taeniasis, Ascariasis, Elephantiasis
(d) Cancer, Tuberculosis, Tetanus

5. Which of the following is a sexually transmitted disease ?
(a) Q fever (b) Leprosy
(c) Whooping cough (d) Gonorrhoea

6. *Aedes aegypti* is a vector of
(a) Both dengue and yellow fever
(b) Dengue fever
(c) Yellow fever
(d) Japanese encephalitis

7. Vaccines are
(a) treated bacteria or viruses or one of their proteins
(b) MHC (major histocompatibility complex) proteins
(c) curative medicines
(d) monoclonal antibodies

8. Small proteins produced by vertebrate cells in response to viral infections inhibiting viral multiplication are known as
(a) Lipoproteins (b) Immuglobulins
(c) Interferons (d) Antitoxins

9. Which one of the following acts as a physiological barrier to the entry of micro-organisms in human body ?
(a) Epithelium of urogenital tract
(b) Tears
(c) Monocytes
(d) Skin

10. Which one of the following is categorised as a parasite in true sense ?
(a) The female *Anopheles* bites and sucks blood from humans.
(b) Human foetus developing inside the uterus draws nourishment from the mother.
(c) Head louse living on the human scalp as well as laying eggs on human hair.
(d) The cuckoo (koel) lays its eggs in crow's nest.

11. At which stage of HIV infection does one usually show symptoms of AIDS?
(a) When the infecting retrovirus enters host cells.
(b) When viral DNA is produced by reverse trancriptase.
(c) When HIV replicates rapidly in helper T-lymphocytes and damages large number of these.
(d) Within 15 day of sexual contact with an infected person.

12. Where will you look for the sporozoites of the malarial parasite?
(a) Saliva of infected female *Anopheles* mosquito.
(b) Red blood corpuscles of humans suffering from malaria.
(c) Spleen of infected humans.
(d) Salivary glands of freshly moulted female *Anopheles* mosquito.

13. Which of the following is a pair of viral diseases?
(a) Common cold, AIDS
(b) Dysentery, common cold
(c) Typhoid, tuberculosis
(d) Ringworm, AIDS

14. To which type of barriers under innate immunity, do the saliva in the mouth and the tears from the eyes, belong?
(a) Cytokine barriers (b) Cellular barriers
(c) Physiological barriers (d) Physical barriers

15. The letter T in T -lymphocyte refers to
(a) Thalamus (b) Tonsil
(c) Thymus (d) Thyroid

16. Which of the following is a pair of viral diseases?
(a) Common cold, AIDS
(b) Dysentery, common cold
(c) Typhoid, tuberculosis
(d) Ringworm, AIDS

17. Which one of the following is correct match?
(a) Reserpine — Tranquilizer
(b) Cocaine — Opiate narcotic
(c) Morphine — Hallucinogenic
(d) Bhang — Analgesic

18. Which of the following is most infectious disease?
(a) Hepatitis - B (b) AIDS
(c) Amoebiosis (d) Malaria

19. Cancerous cells can easily be destroyed by radiations due to
(a) rapid cell division (b) lack of nutrition
(c) fast mutation (d) lack of oxygen

20. Short-lived immunity acquired from mother to foetus across placenta or through mother's milk to the infant is categorised as
(a) innate non-specific immunity
(b) active immunity
(c) passive immunity
(d) cellular immunity

21. Carcinoma refers to
(a) benign tumours of the connective tissue
(b) malignant tumours of the connective tissue
(c) malignant tumours of the skin or mucous membrane
(d) malignant tumours of the colon

22. What is true about T-lymphocytes in mammals?
(a) These are produced in thyroid
(b) There are three main types — cytotoxic T-cells, helper T-cells and suppressor T-cells
(c) These originate in lymphoid tissues
(d) They scavenge damaged cells and cellular debris

23. ELISA is used to detect viruses, where
(a) DNA-probes are required
(b) Southern blotting is done
(c) Alkaline phosphatase is the key reagent
(d) Catalase is the key reagent

24. AIDS is caused by HIV that principally infects:
(a) all lymphocytes (b) activator B cells
(c) cytotoxic T cells (d) T_4 lymphocytes

25. The immune system is involved in
(a) destruction of abnormal or mutant cell types that arise within the body
(b) allergic reactions
(c) rejection of organ transplants
(d) All of the preceding

26. The formation of antibodies within our body is called:
(a) active immuntiy (b) passive immunity
(c) innate immunity (d) acquired immunity

27. Both B cells and T cells of immune system are produced in:
(a) spleen (b) bone marrow
(c) thymus (d) lymph nodes

28. Active immunity is
(a) borrowed from an active disease case.
(b) developed in direct response to a disease agent.
(c) the product of borrowed antibodies.
(d) passive immunity that is activated.

29. In the cell-mediated immune response, T lymphocytes divide and secrete
(a) antigens (b) plasmogens
(c) collagens (d) cytokines

30. Phagocytes
(a) are T and B cells
(b) present antigen on MHC II complexes
(c) digest nonself materials
(d) Both (b) and (c)

31. When the receptor of a T_H cell binds to a pathogen being presented on a macrophage it
(a) activates itself (b) secretes cytokines
(c) activates B cells (d) All of the above

32. Transfusing a person with blood plasma proteins from a person or animal that has been actively immunized against a specific antigen provides
(a) active immunity (b) passive immunity
(c) autoimmunity (d) anti-immunity

33. B lymphocytes are primarily involved in
(a) humoral immunity
(b) autoimmune disorders
(c) graft rejection
(d) cell-mediated immunity

34. Patients with HIV are susceptible to a variety of infections because
(a) the virus produces cell surface receptors that bind to pathogens, making it easier for those pathogens to be infective.
(b) synthesizing a DNA copy of the viral genome makes a person fell sick.
(c) HIV attacks and destroys the T helper cells, which are central to mounting an effective immune response, making those individuals more susceptible to other infections.
(d) HIV destroys B cells so that antibodies cannot be made in response to invading pathogens.

35. Ingestion of marijuana leads to illusions and alters the thoughts, feelings and perceptions of a person. Marijuana is:
(a) narcotic (b) stimulant
(c) hallucinogen (d) sedative

36. "Heroin" is obtained from the plant of the family
(a) leguminosae (b) papaveraceae
(c) liliaceae (d) solanaceae

37. Brown sugar is the commonly used name for
(a) LSD (b) Hashish
(c) Heroin (d) Barbiturates

38. In persons addicted to alcohol the liver gets damaged because it
(a) has to detoxify the alcohol.
(b) stores excess of glycogen.
(c) is over stimulated to secrete more bile.
(d) accumulates excess of fat.

39. A large does of high concentration alcohol causes a painful inflammation of stomach lining called
(a) epilepsy (b) neurosis
(c) psychosis (d) gastritis

40. Damage to thymus in a child may lead to –
(a) a reduction in haemoglobin content of blood
(b) a reduction in stem cell production
(c) loss of antibody mediated immunity
(d) loss of cell mediated immunity

41. The treatment of snake-bite by antivenine is an example of
(a) Artificially acquired active immunity
(b) Artificially acquired passive immunity
(c) Naturally acquired passive immunity
(d) Specific natural immunity

42. Antigen binding site in an antibody is found between –
(a) Two light chains
(b) Two heavy chains
(c) One heavy and one light chain
(d) Either between two light chain or between one heavy and one light chain depending upon the nature of antigen

43. At which stage of HIV infection does one usually show symptoms of AIDS?
(a) When the infecting retrovirus enters host cells
(b) When viral DNA is produced by reverse trancriptase
(c) When HIV replicates rapidly in helper T-lymphocytes and damages large number of these cells.
(d) Within 15 day of sexual contact with an infected person.

44. Which one of the following is categorised as a parasite in true sense ?
(a) The female *Anopheles* bites and sucks blood from humans
(b) Human foetus developing inside the uterus draws nourishment from the mother
(c) Head louse living on the human scalp as well as laying eggs on human hair
(d) The cuckoo (koel) lays its eggs in crow's nest.

45. Cirrhosis of liver is caused by the chronic intake of:
(a) Opium (b) Alcohol
(c) Tobacco (Chewing) (d) Cocaine

46. Opiate narcotic drugs are
(a) Antianxiety (b) Analgesic
(c) Hypnotic (d) Antihistamine

47. The drug useful to increase cardiovascular effects in human beings is
(a) Cocaine (b) Barbiturate
(c) Benzodiazepine (d) Insulin

48. Histamines the inflammation producing substance are produced by which cells of the body ?
(a) mast cells (b) collagen fibres
(c) macrophages (d) sustentacular cells

49. An antibody is a
(a) component of blood
(b) secretion of mammalian erythrocyte
(c) molecule that specifically inactivates
(d) White corpuscl

50. Cancer of blood is called
(a) Leukemia (b) Lymphoma
(c) Sarcoma (d) Hybridoma

EXERCISE - 2
Applied Questions

1. Increased asthmatics attacks in certain seasons are related to:
(a) eating fruits preserved in tin containers
(b) inhalation of seasonal pollen
(c) low temperature
(d) hot and humid environment

2. Which one of the following is the correct statement regarding the particular psychotropic drug specified?
(a) Hashish causes after thought perceptions and hallucinations
(b) *Opium* stimulates nervous system and causes hallucinations
(c) Morphine leads to delusions and disturbed emotions
(d) Barbiturates cause relaxation and temporary euphoria

3. Which one of the following statements is **correct**?
(a) Benign tumours show the property of metastasis.
(b) Heroin accelerates body functions.
(c) Malignant tumours may exhibit metastasis.
(d) Patients who have undergone surgery are given cannabinoids to relieve pain.

4. Select the correct statement from the ones given below.
(a) Barbiturates when given to criminals make them tell the truth
(b) Morphine is often given to persons who have undergone surgery as a pain killer
(c) Chewing tobacco lowers blood pressure and heart rate
(d) Cocaine is given to patients after surgery as it stimulates recovery

5. Which one of the following statements is correct with respect to AIDS?
(a) The HIV can be transmitted through eating food together with an infected person
(b) Drug addicts are least susceptible to HIV infection .
(c) AIDS patients are being fully cured cent per cent with proper care and nutrition
(d) The causative HIV retrovirus enters helper T - lymphocytes thus reducing their numbers

6. Where will you look for the sporozoites of the malarial parasite?
(a) Saliva of infected female *Anopheles* mosquito
(b) Red blood corpuscles of humans suffering from malaria
(c) Spleen of infected humans
(d) Salivary glands of freshly moulted female *Anopheles* mosquito

7. A certain patient is suspected to be suffering from Acquired Immuno Deficiency Syndrome. Which diagnostic technique will you recommend for its detection?
(a) ELISA (b) MRI
(c) Ultra sound (d) Widal test

8. The pathogen *Microsporum* responsible for ringworm disease in humans belongs to the same kingdom of organisms as that of:

(a) *Taenia*, a tapeworm (b) *Wuchereria*, a filarial worm
(c) *Rhizopus*, a mould (d) *Ascaris*, a round worm

9. Which one of the following option gives the correct matching of a disease with its causative organism and mode of infection?

	Disease	Causative Organisms	Mode of Infection
(a)	Typhoid	*Salmonella typhii*	With inspired air
(b)	Pneumonia	*Streptococcus pneumoniae*	Droplet Infection
(c)	Elephantiasis	*Wuchereria bancrofti*	Infected water and food
(d)	Malaria	*Plasmodium vivax*	Bite of male *Anopheles* mosquito

10. Select the correct statement with respect to diseases and immunisation.

(a) If due to some reason B-and T-lymphocytes are damaged, the body will not produce antibodies against a pathogen
(b) Injection of dead / inactivated pathogens causes passive immunity
(c) Certain protozoans have been used to mass produce hepatitis B vaccine.
(d) Injection of snake antivenom against snake bite is an example of active immunisation

11. Common cold differs from pneumonia in, that :

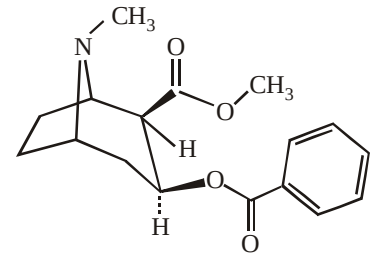
(a) Pneumonia is a communicable disease whereas the common cold is a nutritional deficiency disease.
(b) Pneumonia can be prevented by a live attenuated bacterial vaccine whereas the common cold has no effective vaccine.
(c) Pneumonia is caused by a virus while the common cold is caused by the bacterium *Haemophilus influenzae*.
(d) Pneumonia pathogen infects alveoli whereas the common cold affects nose and respiratory passage but not the lungs.

12. In which one of the following options the two examples are correctly matched with their particular type of immunity

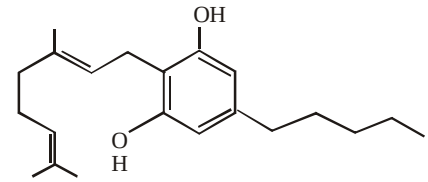
	Examples	Types of immunity
(a)	Polymorphonuclear leukocytes and monocytes	Cellular barriers
(b)	Anti-tetanus and anti-snake bite injection	Active immunity
(c)	Saliva in mouth and Tear in eyes	Physical barriers
(d)	Mucus coating of epithelium lining the urinogenital tract- and the HCl in stomach	Physiological barriers

13. Identify the molecules (a) and (b) shown below and select the right option giving their source and use.

(a)



(b)



	Molecule	Source	Use
(a)	(a) Cocaine	*Erythroxylum coca*	Accelerates the transport of dopamine
(b)	(b) Heroin	*Cannabis sativa*	Depressant and slows down body functions
(c)	(b) Cannabinoid	*Atropa belladona*	Produces hallucinations
(d)	(a) Morphine	*Papaver somniferum*	Sedative and pain killer

14. Which one of the following acts as a physiological barrier to the entry of micro-organisms in human body ?

(a) Epithelium of urogenital tract
(b) Tears
(c) Monocytes
(d) Skin

15. Which one of the following statements is correct with respect to immunity?

(a) Preformed antibodies need to be injected to treat the bite by a viper snake.
(b) The antibodies against small pox pathogen are produced by T – lymphocytes.
(c) Antibodies are protein molecules, each of which has four light chains.
(d) Rejection of a kidney graft is the function of B-lymphocytes.

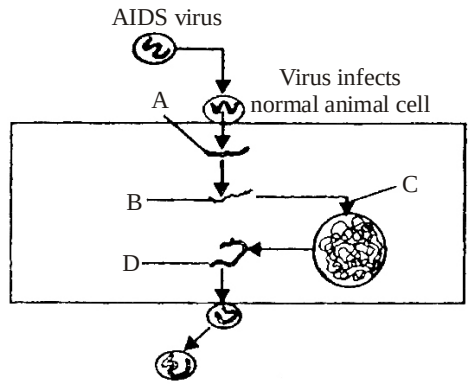
16. If the person shows the production of interferons in his body, chances are that he is suffering from:

(a) Anthrax (b) Malaria
(c) Measels (d) Tetanus

17. Cyclosporin A is an immunosuppressive drug is produced by:

(a) *Aspergillus niger* (b) *Monascus purpureus*
(c) *Penicillium notatum* (d) *Trichoderma polysporum*

18. Refer the given flow chart of the mode of action of AIDS virus and answer the following questions. Identify the labelled sequences A, B, C and D.



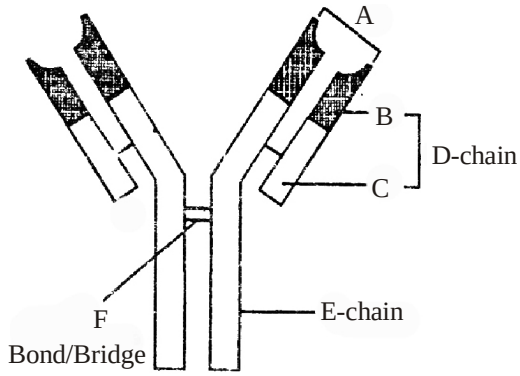
(a) A - Viral DNA introduced into cell; B - Viral DNA; C - Viral DNA incorporates into host RNA; D - New viral RNA produced

(b) A - Viral RNA introduced into cell; B - Viral RNA; C - Viral DNA incorporates into host DNA; D - New viral DNA produced

(c) A - Viral RNA introduced into cell; B - Viral DNA; C - Viral DNA incorporates into host DNA; D - New viral RNA produced

(d) A - Viral DNA introduced into cell; B - Viral RNA; C - Viral RNA incorporates into host DNA; D - New viral DNA produced

19. The diagram shows an antibody molecule. Identify A to F.



(a) A-Antigen binding site; B-Variable region (of L-Chain); C - Constant region (of L-Chain); D - Light polypeptide chain (L-Chain); E-Heavy polypeptide chain (H-Chain); F - Disulfide (bond)

(b) A - Antigen binding site; B-Constant region (of L-Chain); C - Variable region (of L-Chain); D - Light polypeptide chain (L-Chain); E-Heavy polypeptide chain (H-Chain); F - Disulfide (bond)

(c) A-Antigen binding site; B-Variable region (of L-Chain); C - Constant region (of L-Chain); D - Heavy polypeptide chain (L-Chain); E - Light polypeptide chain (H-Chain); F - Hydrogen (bond)

(d) A-Antigen binding site; B-Variable region (of L-Chain); C - Constant region (of L-Chain); D - Light polypeptide chain (L-Chain); E - Heavy polypeptide chain (H-Chain); F - Hydrogen (bond)

20. Match Column -I with Column - II.

	Column-I (Bacteria)		**Column-II (Diseases)**
A.	*Treponema pallidum*	1.	Plague
B.	*Yersinia pestis*	2.	Anthrax
C.	*Bacillus anthrasis*	3.	Syphilis
D.	*Vibrio cholerae*	4.	Cholera

(a) A → (a); B → (c); C → (b); D → (d)

(b) A → (c); B → (a); C → (b); D → (d)

(c) A → (b); B → (c); C → (a); D → (d)

(d) A → (d); B → (c); C → (a); D → (b)

21. Match Column -I with Column - II.

	Column-I		**Column-II**
A.	LSD	1.	Euphorian effect
B.	Cocaine	2.	Cannabis
C.	Hashish	3.	Ergot alkaloid

(a) A → (c); B → (a); C → (b)

(b) A → (a); B → (b); C → (c)

(c) A → (c); B → (b); C → (a)

(d) A → (a); B → (c); C → (b)

22. Out of the following diseases which are caused due to bacterial infection ?

(a) Typhoid (b) Elephantiasis

(c) Cholera (d) Tuberculosis

(a) (a) and (b) (b) (b) and (c)

(c) (a), (c) and (d) (d) All of these

23. Diseases of human being caused by protozoan parasites are

(a) amoebiasis (b) malaria

(c) trypanosomiasis (d) typhoid

(a) (a) and (b) (b) (a), (b) and (c)

(c) (a), (c) and (d) (d) All of these

DIRECTIONS for Qs. 24 and 25: Each questions contain STATEMENT-1 (Assertion) and STATEMENT-2 (Reason). Each question has 4 choices (a), (b), (c) and (d) out of which ONLY ONE is correct.

(a) Statement- 1 is True, Statement-2 is True, Statement-2 is a correct explanation for Statement -1

(b) Statement -1 is True, Statement -2 is True ; Statement-2 is NOT a correct explanation for Statement - 1

(c) Statement - 1 is True, Statement- 2 is False

(d) Both the Statements are False.

24. **Statement 1 :** SCID is a primary immunodeficiency.
Statement 2 : It is a serious congenital immunodeficiency.

25. **Statement 1 :** HIV infection can be avoided by use of condoms.
Statement 2 : Condoms secrete anti-viral interferons.

EXERCISE - 3
Exemplar & Past Years NEET/AIPMT Questions

Exemplar Question

1. The term 'Health' is defined in many ways. The most accurate definition of the health would be
(a) health is the state of body and mind in a balanced condition
(b) health is the reflection of a smiling face
(c) health is a state of complete physical, mental and social well-being
(d) health is the symbol of economic prosperity.

2. The organisms which cause diseases in plants and animals are called
(a) pathogens (b) vectors
(c) insects (d) worms

3. The chemical test that is used for diagnosis of typhoid is
(a) ELISA test (b) ESR test
(c) PCR test (d) Widal test

4. Diseases are broadly grouped into infectious and non-infectious diseases. In the list given below, identify the infectious diseases
I. Cancer II. Influenza
III. Allergy IV. Smallpox
(a) I and II (b) II and III
(c) III and IV (d) II and IV

5. The sporozoites that cause infection when a female Anopheles mosquito bites a human being are formed in
(a) liver of human
(b) RBCs of mosquito
(c) salivary glands of mosquito
(d) intestine of human

6. The disease chikungunya is transmitted by
(a) house flies (b) Aedes mosquitoes
(c) cockroach (d) female Anopheles

7. Many diseases can be diagnosed by observing the symptoms in the patient. Which group of symptoms are indicative of pneumonia?
(a) Difficulty in respiration, fever, chills, cough and headache
(b) Constipation, abdominal pain, cramps and blood clots
(c) Nasal congestion and discharge, cough, sore throat and headache.
(d) High fever, weakness, stomach pain, loss of appetite and constipation.

8. The genes causing cancer are
(a) structural genes (b) expressor genes
(c) oncogenes (d) regulatory genes

9. In malignant tumours, the cells proliferate, grow rapidly and move to other parts of the body to form new tumours. This stage of disease is called
(a) metagenesis (b) metastasis
(c) teratogenesis (d) mitosis

10. When an apparently healthy person is diagnosed as unhealthy by a psychiatrist, the reason could be that
(a) the patient was not efficient at his work
(b) the patient was not economically prosperous
(c) the patient shows behavioural and social maladjustment
(d) he does not take interest in sports

11. Which of the following are the reason(s) for rheumatoid arthritis? Choose the correct option.
I. Lymphocytes become more active
II. Body attacks self cells
III. More antibodies are produced in the body
IV. The ability to differentiate pathogens or foreign molecules from self cell is lost
(a) I and II (b) II and IV
(c) III and IV (d) I and III

12. AIDS is caused by HIV. Among the following, which one is not a mode of transmission of HIV?
(a) Transfusion of contaminated blood
(b) Sharing the infected needles
(c) Shaking hands with infected persons
(d) Sexual contact with infected persons

13. 'Smack' is a drug obtained from the
(a) latex of *Papaver somniferum*
(b) leaves of *Cannabis sativa*
(c) flowers of *Dhatura pinata*
(d) fruits of *Erythroxyl coca*

14. 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

15. Transplantation of tissues/organs to save certain patients often fail due to rejection of such tissues/organs by the patient. Which type of immune response is responsible for such rejections?
(a) Auto-immune response
(b) Humoral immune response
(c) Physiological immune response
(d) Cell-mediated immune response

16. Antibodies present in colostrum which protect the new born from certain diseases is of
(a) IgG type (b) IgA type
(c) IgD type (d) IgE type

17. Tobacco consumption is known to stimulate secretion of adrenaline and noradrenaline. The component causing this could be.
(a) nicotine (b) tannic acid
(c) curaimin (d) catechine

18. Anti venom against snake poison contains
(a) antigens
(b) antigen-antibody complexes
(c) antibodies
(d) enzymes

19. Which of the following is not a lymphoid tissue?
(a) Spleen (b) Tonsils
(c) Appendix (d) Thymus

20. Which of the following glands is large sized at birth but reduces in size with ageing?
(a) Pineal (b) Pituitary
(c) Thymus (d) Thyroid

21. Haemozoin is
(a) precursor of haemoglobin
(b) toxin from streptococcus
(c) toxin from Plasmodium species
(d) toxin from Haemophilus species

22. One of the following is not causal organism for ringworm
(a) *Microsporum*
(b) *Trichophyton*
(c) *Epidermophyton*
(d) *Macrosporum*

23. 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

NEET/AIPMT (2013-2017) Questions

24. Infection of *Ascaris* usually occurs by : ***[2013]***
(a) Eating imperfectly cooked pork.
(b) Tse-tse fly.
(c) Mosquito bite.
(d) Drinking water containing eggs of *Ascaris*.

25. The cell-mediated immunity inside the human body is carried out by : ***[2013]***
(a) B-lymphocytes (b) Thrombocytes
(c) Erythrocytes (d) T-lymphocytes

26. Identify the site where *Wuchereria bancrofti* is normally found on human body ***[NEET Kar. 2013]***
(a) Lymphatic vessels of the lower limbs
(b) Muscles of the legs
(c) Blood vessels of the thigh region
(d) Skin between the fingers

27. Which one of the following is a hallucinogenic drug? ***[NEET Kar. 2013]***
(a) Opium
(b) Caffeine
(c) Morphine
(d) Lysergic acid diethylamide

28. Which is the particular type of drug that is obtained from the plant whose one flowering branch is shown below? ***[2014]***

(a) Hallucinogen (b) Depressant
(c) Stimulant (d) Pain - killer

29. At which stage of HIV infection does one usually show symptoms of AIDS:- ***[2014]***
(a) Within 15 days of sexual contact with an infected person.
(b) When the infected retro virus enters host cells.
(c) When HIV damages large number of helper T-Lymphocytes.
(d) When the viral DNA is produced by reverse transcriptase.

30. Which of the following is not a sexually transmitted disease ? ***[2015 RS]***
(a) Acquired Immuno Deficiency Syndrome (AIDS)
(b) Trichomoniasis
(c) Encephalitis
(d) Syphilis

31. HIV that causes AIDS, first starts destroying: ***[2015 RS]***
(a) Leucocytes
(b) Helper T- Lymphocytes
(c) Thrombocytes
(d) B- Lymphocytes

32. The active form of *Entamoeba histolytica* feeds upon: ***[2015 RS]***
(a) mucosa and submucosa of colon only
(b) food in intestine
(c) blood only
(d) erythrocytes; mucosa and submucosa of colon

33. Which of the following viruses is not transferred through semen of an infected male? ***[2015 RS]***
(a) Human immunodeficiency virus
(b) Chikungunya virus
(c) Ebola virus
(d) Hepatitis B virus

34. Match each disease with its correct type of vaccine: ***[2015 RS]***

(A) Tuberculosis		(i) harmless virus	
(B) Whooping cough		(ii) inactivated toxin	
(C) Diphtheria		(iii) killed bacteria	
(D) Polio		(iv) harmless bacteria	
	(A)	(B)	(C)	(D)
(a)	(iii)	(ii)	(iv)	(i)
(b)	(iv)	(iii)	(ii)	(i)
(c)	(i)	(ii)	(iv)	(iii)
(d)	(ii)	(i)	(iii)	(iv)

35. Which of the following endoparasites of humans does show viviparity ? ***[2015 RS]***
(a) *Enterobius vermicularis*
(b) *Trichinella spiralis*
(c) *Ascaris lumbricoides*
(d) *Ancylostoma duodenale*

36. Which one of the following immunoglobulins does constitute the largest percentage in human milk? ***[2015 RS]***
(a) lg M (b) lg A
(c) lg G (d) lg D

37. If you suspect major deficiency of antibodies in a person, to which of the following would you look for confirmatory evidences? ***[2015 RS]***
(a) Serum albumins
(b) Haemocytes
(c) Serum globulins
(d) Fibrinogin in plasma

38. Which of the following diseases is caused by a protozoan ? ***[2015 RS]***
(a) Influenza (b) Babesiosis
(c) Blastomycosis (d) Syphilis

39. Select the wrong statements : ***[2015 RS]***
(a) W.M. Stanley showed that viruses could be crystallized
(b) The term '*contagium vivum fluidum*' was coined by M.W. Bejerinek
(c) Mosaic disease in tobacco and AIDS in human being are caused by viruses
(d) The viroids were dicovered by D.J. Ivanowski

40. Grafted kidney may be rejected in a patient due to : ***[2015 RS]***
(a) Cell-mediated immune response
(b) Passive immune response
(c) Innate immune response
(d) Humoral immune response

41. Asthma may be attributed to ***[2015 RS]***
(a) bacterial infection of the lungs.
(b) allergic reaction of the mast cell in the lungs
(c) inflammation of the trachea
(d) accumulation of fluid in the lungs

42. Antivenom injection contains preformed antibodies while polio drops that are administered into the body contain ***[2016]***
(a) Activated pathogens
(b) Harvested antibodies
(c) Gamma globulin
(d) Attenuated pathogens

43. Reduction in pH of blood will ***[2016]***
(a) reduce the rate of heart beat.
(b) reduce the blood supply to the brain.
(c) decrease the affinity of hemoglobin with oxygen.
(d) release bicarbonate ions by the liver.

44. Which of the following statements is not true for cancer cells in relation to mutations ? ***[2016]***
(a) Mutations in proto-oncogenes accelerate the cell cycle.
(b) Mutations destroy telomerase inhibitor.
(c) Mutations inactive the cell control.
(d) Mutations inhibit production of telomerase.

45. Match the following sexually transmitted diseases (Column-I) with their causative agent (Column-II) and select the correct option : ***[2017]***

Column-I	**Column-II**
(A) Gonorrhea	(i) HIV
(B) Syphilis	(ii) *Neisseria*
(C) Genital Warts	(iii) *Treponema*
(D) AIDS	(iv) Human papilloma-Virus

	(A)	(B)	(C)	(D)
(a)	(iii)	(iv)	(i)	(ii)
(b)	(iv)	(ii)	(iii)	(i)
(c)	(iv)	(iii)	(ii)	(i)
(d)	(ii)	(iii)	(iv)	(i)

46. Transplantation of tissues/organs fails often due to non-acceptance by the patient's body. Which type of immune-response is responsible for such rejections? ***[2017]***
(a) Cell - mediated immune response
(b) Hormonal immune response
(c) Physiological immune response
(d) Autoimmune response

47. MALT constitutes about _____ percent of the lymphoid tissue in human body. ***[2017]***
(a) 20% (b) 70%
(c) 10% (d) 50%

48. In higher vertebrates, the immune system can distinguish self-cells and non-self. If this property is lost due to genetic abnormality and it attacks self-cells, then it leads to ***[2016]***
(a) allergic response
(b) graft rejection
(c) auto-immune disease
(d) active immunity

Hints & Solutions

EXERCISE - 1

1. (a) 2. (a)
3. (c) A sickle cell anaemia affected person is more resistant to mosquito born infectious disease because the sickle - cell shaped RBCs are hostile to the protozoa *Plasmodium.*
4. (d) Rabies, Influenza and AIDS are viral diseases, Amoebiasis, Ascariasis and Trypanosomiasis are caused by Protozoa; Taeniasis, Ascariasis and Elephantasis are the diseases caused by Helminths but Cancer, Tuberculosis and Tetanus are not related diseases. Tuberculosis and Tetanus are bacterial diseases while cancer is not.
5. (d) A common sexually transmitted disease most often affecting the genitourinary tract and occasionally, the pharynx, conjuctiva, or rectum.
6. (a)
7. (a) Vaccine contains dead, attenuated form or antigen of a pathogen which can be injected to provide immunity towards that pathogen. Monoclonal antibodies are homogenous immunological reagents of defined specificity, so that these can be utilized for diagnosis and screening with certainty.
8. (c) Lipoproteins are conjugated proteins having polypeptides in association with lipids. Immunoglobulins are the constituent of antibodies. Interferons (INFs) are a group of three vertebrate glycoproteins (*i.e.* α, β, γ,) Out of these three α and β are produced within virally infected cells.
   Interferon induces among adjacent cells, as antiviral state by inducing synthesis of the enzymes which inhibit the viral production cycle.
9. (d) 10. (c) 11. (c) 12. (a) 13. (a)
14. (c) The saliva in the mouth and the tears from the eyes belongs to physiological barriers.
15. (c) The letter T in T-lymphocyte refers to thymus. In human anatomy, the thymus is an organ located in the upper anterior portion of the chest cavity just behind the sternum. The thymus gland is a pink-grey organ that lies underneath the top of the breast bone.
16. (a) Common Cold, AIDS is a pair of viral diseases. Viruses are a very common type of infectious disease. Viruses are the smallest life-form existing, since they are not even a single cell. It is almost like they are not alive at all. They are small strands of DNA-like cell material. A virus consists mostly of RNA and cannot survive without host cells.
17. (a) Morphine is an opiate narcotic, Bhang is a hallucinogen, Reserpine derived form *Rauwolffia*, is used as tranquilizer, cocaine is a stimulant.
18. (a) We know that HBV causes serum hepatitis. It is most frequently transmitted by blood or by blood contaminated instruments.
19. (a) The ability of radiations to kill cells is highest in the tissue with the highest number of dividing cells. Tumour cells proliferate rapidly. Hence, tumours are killed more rapidly by radiations.
20. (c)
21. (c) Carcinomas are malignant growths of the epithelial tissue that cover or line body organs.
22. (c) The lymphocytes which differentiate in the thymus are known as the T-lymphocytes. T-lymphocytes are responsible for the cellular immune response.
23. (c) ELISA test is a technique used to detect and quantitate extremely small amount of a protein, antibody or antigen with the help of enzyme. The commonly used enzymes are peroxidase and alkaline phosphatase. Southern blotting and DNA probes are used in molecular analysis of DNA. Catalase is not involved in ELISA.
24. (d) AIDS virus infects T_4 lymphocytes (also called Helper cells). Cytotoxic T cells called T_8 lymphocytes.
25. (d) The immune system is involved in all of the functions listed.
26. (a) 27. (b)
28. (b) The individual is actively involved in the production of antibodies.
29. (d) T-lymphocytes perform several immune functions including the release of cytokines.
30. (c) Phagocytes are nonspecific cells (not B and T cells) that digest nonself materials and present protein fragments of those nonself materials on their surface. They do not have antibodies.
31. (d) When the T_H cell binds antigen being presented on a macrophage, it secretes cytokines which activate itself and B cells.
32. (b) Passive immunity is conferred by the transfer of antibodies from one individual to another.
33. (a) B lymphocytes are involved in humoral immunity by producing antibodies.
34. (c) An HIV-infected individual is more susceptible to a variety of infections because the virus destroys T_H cells, which are essential for mounting an effective immune response. HIV does not bind to pathogens; it binds to T_H cells. HIV does not destroy B cells.
35. (c) Marijuana is a widely used illegal drug obtained from dried unfertilised female inflorescence of Hemp.
36. (b)
37. (c) Heroin is commonly known as Smack or Brown Sugar.
38. (a)

39. (d) Small dose of low concentration (about 10%) alcohol stimulates the secretion of gastric juice. But a large dose of high concentration alcohol causes painful inflammation of stomach lining called gastritis.
40. (d) 41. (b) 42. (c)
43. (c) When HIV replicates rapidly in helper T-lymphocytes and damages large number of these cells, at this stage infected persons start showing symptoms of AIDS.
44. (c) Head louse is an obligate ectoparasite of human scalp and as well as laying egg on human hair.
45. (b) Long term intake of alcohol causes damage to liver which is known as cirrhosis of liver with continued alcohol intake, there is destruction of hepatocytes and fibroblasts (cell which form fibres) and slimulaties of collagen protein formation.
46. (b) 47. (a) 48. (a) 49. (c) 50. (a)

EXERCISE - 2

1. (b) Pollen–grains of many species are responsible for some of the severe allergies and bronchial affliction in some people often lead to chronic respiratory disorders - asthma, bronchitis.
2. (a) Hashish causes after thought perceptions and hallucinations. Hashish is a preparation of *Cannabis* composed of the compressed trichomes collected from the *Cannabis* plant. Psychoactive effects vary between types of Hashish but are usually the same as those of other *Cannabis* preparations such as marijuana. Hash is generally prohibited to the same extent as all other forms of cannabis. It is consumed in much the same way as *Cannabis* buds, used by itself in miniature smoking pipes, vapourized, hot knifed, or smoked in joints mixed with tobacco, *Cannabis* buds or other herbs.
3. (c) Malignant tumours may exhibit metastasis. Cancer (medical term: malignant neoplasm) is a class of diseases in which a group of cells display uncontrolled growth (division beyond the normal limits), invasion (intrusion on and destruction of adjacent tissues), and sometimes metastasis spread to other locations in the body *via* lymph or blood.
4. (b) Morphine is potent opioid analgesic that is often given to persons (who have undergone surgery) as a pain killer. It is mainly used to relieve severe and persistent pain. It is administrated by mouth, injection or suppositories.
5. (d) AIDS (Acquired Immune Deficiency Syndrome) is caused by HIV retrovirus. The virus destroys the helper T-lymphocytes thus reducing their numbers.
6. (a) Sporozoites of malarial parasite are found in saliva of infected female *Anopheles* mosquito.
7. (a) ELISA is an fundamental tool of clinical immunology and is used as an initial screen for HIV detection.
8. (c) *Microsporum* is a member of Deuteromycetes of fungi & *Rhizopus* is also fungi and member of Zygomycetes.
9. (b) Pneumonia disease is spreaded by the organism *Streptococcus pneumoniae* and the mode of infection is by droplet infection.
10. (a) B and T-lymphocytes produce antibodies against pathogen in the body, if due to some reason B and T lymphocytes are damaged the body will not produce antibodies against a pathogen. Each B cell and T cell is specific for a particular antigen.
11. (d) Common cold is most infectious viral disease caused by *Rhino* viruses which is transmitted through inhalation of droplets from infected person or through contaminated objects. Pneumonia is a bacterial disease caused by *Streptococcus pneumoniae* and *Haemophillus influenzae*. This serious disease of lungs spread by sputum of the patient.
12. (a) Polymorphonuclear leukoytes named so, as they have multilobed nucleus or neutrophils and monoytes are the cellular barrier provide innate or nonspecific immunity. Cellular barriers are the internal defence or second live of defence.
13. (d) Molecule (a) represents structure of morphine. Morphine is the most abundant alkaloid found in opium, the dried sap (latex) derived from shallowly slicing the unripe seedpods of the opium, or common and/or edible, poppy Papaver *somniferum*. Morphine is a potent opiate analgesic drug that is used to relieve severe pain.
14. (d) Skin has a metabolic function to prevent non- resident bacteria from developing.
15. (a) Preformed antibodies need to be injected to treat the bite by a viper snake. It is also a type of immunization which is called as passive immunization.
    Antibodies, produced by B-cells, are typically made of basic structural units—each with two large heavy chains and two small light chains. B cells differentiate into plasma cells that secrete antibodies. Antibodies are proteins that bind to specific antigens and mark them for destruction by, for example, marking them more recognizable to phagocytic cells. Rejection of a kidney graft is not a function of B lymphocyte.
16. (c) 17. (d) 18. (c) 19. (a) 20. (b) 21. (a)
22. (c) 23. (b)
24. (a) Severe combined Immuno - deficiency (SCID) is the most serious congential immuno-deficiency of children so called primary immunodeficiency.
25. (c) The use of condoms has been shown to decrease the transmission AIDS because condoms is contraceptic.

EXERCISE - 3

Exemplar Questions

1. (c) 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 happy with smiling face and more efficient at work.

This increases productivity and brings economic prosperity. it also increases longevity of people and reduces infant and maternal mortality.

2. (a) There are wide range of organisms including bacteria, viruses, fungi, protozoans, helminths, etc., cause diseases in plants and animals. Such disease causing organisms are known as pathogens. While vectors are the carriers of pathogens which may be insects or worms.

3. (d) Typhoid fever could be confirmed by **Widal test**, while **ELISA** (Enzyme Linked Immunosorbent Eassy) is a widely used as diagnostic test for AIDS. **PCR test** is used to identify the genomic sequences of organisms.
ESR (Erythrocyte Sedimentation Rate) test is a type of blood test.

4. (d) Influenza which is commonly known as the 'flu' is an infectious disease of birds and mammals that caused by influenza viruses. The most common symptoms are chill, fever, runny nose, sore throat, muscle pain, headache, coughing, weakness/fatigue and discomfort.
Cancer is defined as an uncontrolled division or proliferation of cells without any differentiation. It is non-infectious disease caused by the agents called carcinogens.
Smallpox is a serious, highly contagious and often life threatening disease characterised by a rash and (blisters) on the face, arms and legs. It is caused by the Variola virus. It gets transmitted from a person to others by various means like sneeze, saliva, contaminated body fluids, etc.
The exaggerated response of the immune system to certain antigens in the environment (pollen, dust, mites, molds, cloth fibres, animal hair, etc) is known as allergy. It occurs due to the release of chemicals like histamine and serotonin from the mast cells. It is non-infectious responce.

5. (c) Sporozoites enter the female *Anopheles* mosquito when they bite an infected person where these sporozoite fertilise and multiply in the stomach wall of the female *Anopheles* and get stored in the salivary gland of mosquito till and is again transferred to the human body by a mosquito bite.
After it enters the human body the sporozoites reach the liver cells, where they multiply. This is followed by their attack on red blood cells resulting in their rupture. The ruptured RBCs release a toxin called haemozoin, which is responsible for high fever, chills and shivering.

6. (b) Chikungunya is transmitted by the vector *Aedes* mosquitoes. Whereas the vector for cholera is housefly. cockroach transmit jaundice or yellow fever and is a carrier of food and waterborne disease. Female *anopheles* is responsible for spreading malaria.

7. (b)

Symptoms	**Diseases**
• Difficulty in respiration, fever, chills, cough and headache.	Pneumonia
• Constipation, abdominal pain, cramp and blood dots.	Amoebiasis
• Nasal congestion and discharge, cough, sore throat and headache.	Common cold/ influenza
• High fever, weakness, stomach pain, loss of appetite and constipation.	Typhoid

8. (c) Genes having normal cells are called cellular oncogenes or proto-oncogenes, which are present in inactivated state but under certain conditions like mutation, these get transformed into cancer causing oncogens, whereas structural gene, expressor gene and regulatory genes are responsible for regulation of gene expression (operon model).

9. (b) Cancer is defined as an uncontrolled division or proliferation of cells without any differentiation. Repeated division of cells form a large mass of tissue called tumours. These are of two types *i.e.*, benign (non-cancerous) and malignant (cancerous).
The invasion of malignant tumour from primary site of cancer to the other secondary growth is called metastasis, while metagenesis is the alteration of generation.
Tetragenesis is a prenatal toxicity, that is characterised by structural, functional defects in the developing embryo or foetus. Mitosis is a type of cell division that results in two daughter cells.

10. (c) A state of complete physical, mental and social well being is defined as health. So, when psychiatrist diagnose healthy person as unhealthy, the reason could be that the patient shown behavioural and social maladjustment. Due to mental discomfort.

11. (b) Autoimmunity is an abnormal immune response in which the immune system of the body starts rejecting its own body cells or 'self' cells. Sometimes, body looses its ability to differentiate between pathogen or foreign molecules from self cell and attack self-cells. This results in damage to the body.
While if any foreign antigen enters into body the lymphocytes become more active and produces more antibodies in its response in the body.

12. (c) Transmission of HIV-infection generally occurs by
(i) Sexual contact with infected person
(ii) Transfusion of contaminated blood and blood products.
(iii) Sharing infected needles as in the case of intravenous drug abusers
(iv) Infected mother to her child through placenta.
Shaking hand with infected persons does not transmit HIV.

13. (a) Heroin, chemically called as diacetyl morphine that is a white, odourless, bitter, crystalline compound. It is obtained by acetylation of morphine and extracted from

the latex of poppy plant (*Papaver somniferum*), but Leaves of *Cannabis sativa* commonly called bhang produces connabinoids.

Active chemical of Dhatura flower is tropane alkaloids mainly scopolamines, hyoscyamine and atropine.

14. (c) Interferons are the proteins secreted by virus infected cell, that protect non-infected cells from further viral infection.

Serotonin is a neurotransmitter that leads to depression.

Colostrum is a neurotransmitter that leads to depression.

Histamine is also a neurotransmitter involved in inflammatory response.

15. (d) The replacement of a diseased organ or tissue of an individual with healthy organ or tissue of same or another individual is called transplantation. These transplants or graft gets rejected if it's recognised as foreign antigen by the body's immune systems.

Cell mediated immune response is mediated by T-lymphocyte which is able to differentiate between self and non-self cell/organ. This type of immune response recognise the body's non-cells or other tissue or organs from other individual as foreign antigen and cause rejection of the graft.

16. (b) During the initial days of lactation the yellowish fluid colostrum is secreted by mother. It has abundant antibodies (IgA) that protects the infant from several diseases.

IgG immunoglobulin (antibody) is most abundant (appro. 80%) antibody in human and found in serum IgA is second abundant (approx. 10-15%) antibody. It is found in saliva and tear also. IgD and IgE constitute 2-3% of total antibodies which are found in most cells and serum.

17. (a) Tobacco has nicotine, that stimulates the adrenal gland to release adrenaline and noradrenaline which in turn increases the blood pressure and heart rate, while tannic acid is a type of polyphenol which is used as a mordant, curaimin, obtained from curcumin in a pain releiver and catechine derived from catechu is an antioxidant.

18. (c) A biological product that typically consists of venom neutralising antibodies derived from a host animal snake antivenom, such as a horse or sheep, it is not considered as antigen or antigen-antibody complex or enzyme.

19. (c) The organs where origin and/or maturation and proliferation of lymphocytes occur are lymphoid organs

Lymphoid Organs

Primary Lymphoid Organs	Secondary Lymphoid Organs
• Bone marrow • Thymus	• Spleen • Lymph nodes • Tonsils • Peyer's patches of small intestine • Appendix, etc.

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

Sometime appendix is not considered as the lymphoid organ,as it has been proposed to be a vestigial structure connected to the cecum, located near the junction of the small intestine and the large intestine.

20. (c) The thymus is a lobed organ that is located near the heart and beneath the breastbone. It is quite large at the time of birth but keeps reducing in size with age and by the time puberty is attained it reduces to a very small size.

While the size of pineal gland (located at brain), pituitary gland (in brain), thyroid (located in front of neck) remains constant in size since birth.

21. (c) Haemozoin is a toxin released by *Plasmodium* species, that is responsible for the chill and high fever recurring every three to four days.

To continue their life-cycle, Plasmodium enters the human body as sporozoites and multiply within the liver cells, resulting in the rupture of the RBCs.

The rupture of RBCs is associated with release of a toxic substance, haemozoites while *Streptococcus* produces streptomycin and streptococcal pyrogenic exotoxin that shows haemolytic and *Haemophilus* produces cytolethal distending toxin (HdCDT) that inhibit mammals cell proliferation.

22. (d) Ringworm infections are caused by fungi that belongs to the genera *Microsporum trichophyton* and *Epidermophyton*.

Macrosporum is an ectomycorhizal zoosporic fungus causing diseases of economically important vascular plants.

23. (c) Sickle-cell anaemia is related with malaria not to typhoid and person suffering from sickle-cell anaemia are resistant to malarial parasite and RBC of sickle-cell anaemia patients is distored in shape that is not affected by *Plasmodium* sp.

it is known that heterozygotes (Hb^S/HB^A), having both types of haemoglobin show resistance to malarial infection because the body targets the *P. falciparum* infected cells for destruction.

In contrast, due to malarial infection individuals homozygous for normal haemoglobin (Hb^A/Hb^A) suffer high mortality rates in early childhood.

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24. (d) *Ascaris*, an intestinal parasite causes **ascariasis.** Symptoms of these disease include internal bleeding, muscular pain, fever, anaemia 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.

25. (d) T – lymphocytes mediates cell mediated immunity (CMI). It is one of the two types of acquired immunity responsible for graft or transplant rejection.
26. (a) *Wuchereria (W. bancrofti* and *W. malayi),* filarial worms causing chronic inflammation of the organs in which they live for many years, usually the lymphatic vessels of the lower limbs and the disease caused by them known as **elephantiasis** or **filariasis.** The genital organs are mainly affected, resulting in gross deformities. The pathogens are transmitted to a healthy person through the bite by the female mosquito vectors.
27. (d) Hallucinogens are drugs that cause illusions and delusions (hallucinations) and change the feelings or perception. Examples are Bhang, Charas, Hashish, Marijuana (all cannabinoids) and LSD (Lysergic acid diethylamide). Opium and morphine are opiate narcotics (opioids) having analgesic (pain relieving effect) while caffeine is a stimulant that increase the activity of nervous system, and cause awakening.
28. (a) The plant illustrated in diagram is *Datura* which has hallucinogenic properties. Hallucinogen is a substance that produces psychological effects normally associated only with dreams, schizophrenia, or religious visions. It produces changes in perception (ranging from distortions in what is sensed to perceptions of objects where there are none), thought, and feeling.
29. (c) HIV infection does usually show symptoms of AIDS When HIV damages large number of helper T-Lymphocytes (CD4 cells). AIDS is the stage of HIV infection that occurs when one immune system is badly damaged and one become vulnerable to infections and infection-related cancers called opportunistic infections. When the number of ones CD4 cells falls below 200 cells per cubic millimetre of blood (200 cells/mm3), one is considered to have progressed to AIDS.
30. (c) Encephalitis is a disease of inflammation of the brain. It is not transmitted sexually. Most commonly it is caused by a virus.
31. (b) After infection, HIV starts to destroy the T-cells (T-helper lymphocytes). T. cells are very important for the immune system. In the early stage of infection, the decline in numbers of T.cells is observed.
32. (d) *Entamoeba histolytica* is found in the colon. It feeds on mucosa and submucosa as well as phagocytose RBCs.
33. (b) The virus of chikunguniya is *Arbovirus* transmitted by *Aedes* mosquito. In this disease the patient feels fever lasting 2-7 days.
34. (b) Tuberculosis vaccine (BCG) has inactivated bacteria. In whooping cough vaccine, there are killed pathogens of *Bordetella pertussis* which cause whooping cough. In DPT diphtheria toxoid is present. Sabin polio vaccine contains inactivated virus.
35. (b) *Trichinella spiralis* is an endoparasite found in human intestine. It is the smallest nematode producing larvae in large number. These larvae bore the intestine of human being and enter the blood and lymphatic systems.
36. (b) Colostrum contains high levels of lgA, which gives passive immunity to foetus.
37. (c) Serum globulins test provides confirmatory evidence measuring the deficiency of antibodies (-globulin) in a person.
38. (b) Babesiosis is malaria like disease caused by protozoon-*Babesia*. In this desease haemoglobinuric fever takes place.
39. (d) T.O. Dinear (1971) discovered the viroids which are smaller than viruses.
40. (a) Cell-midiated immune response is a system which is specialized for a particular person.
41. (b) A mast cell or a mastocyte is typically a white blood cell. It is a special kind of granulocyte, which is a part of the immune system and laden with histamine and heparin. Besides these, mast cells also secrete the prostaglandin (PG) D2, and leukotriene (LT) C4, which are capable of inducing bronchoconstriction and mucosal edema, both features of asthma.
42. (d) Oral Polio Vaccine consists of a mixture of attenuated (weakened) poliovirus strains of all three poliovirus types.
43. (c) Reduction of pH of blood will decrease the affinity of hemoglobin with oxygen which in turn causes acidosis.
44. (d) Telomerase production is increased in cancer. Telomerase has been examined in hundreds of studies as a potentially sensitive biomarker for screening, early cancer detection, prognosis or in monitoring as an indication of residual disease.
45. (d) Gonorrhoea – *Neisseria* (Bacteria)
Syphilis – *Treponema* (Bacteria)
Genital Warts – Human papilloma virus
AIDS – HIV (Virus)
46. (a) Cell mediated immune response causes non-acceptance or rejection of graft or transplanted tissues/organs.
47. (d) MALT or Mucosa Associated Lymphoid Tissue constitutes about 50 percent of the lymphoid tissue in human body. It is scattered along mucosal lining in the human body.
48. (c) An autoimmune disease is a pathological state arising from an abnormal immune response of the body to substances and tissues that are normally present in the body.