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BIOLOGY

CLASS IX
FOUNDATION

4 | WHY DO WE FALL ILL?

Chapter Outline

Edward Jenner
(May 1749 – January 1823)

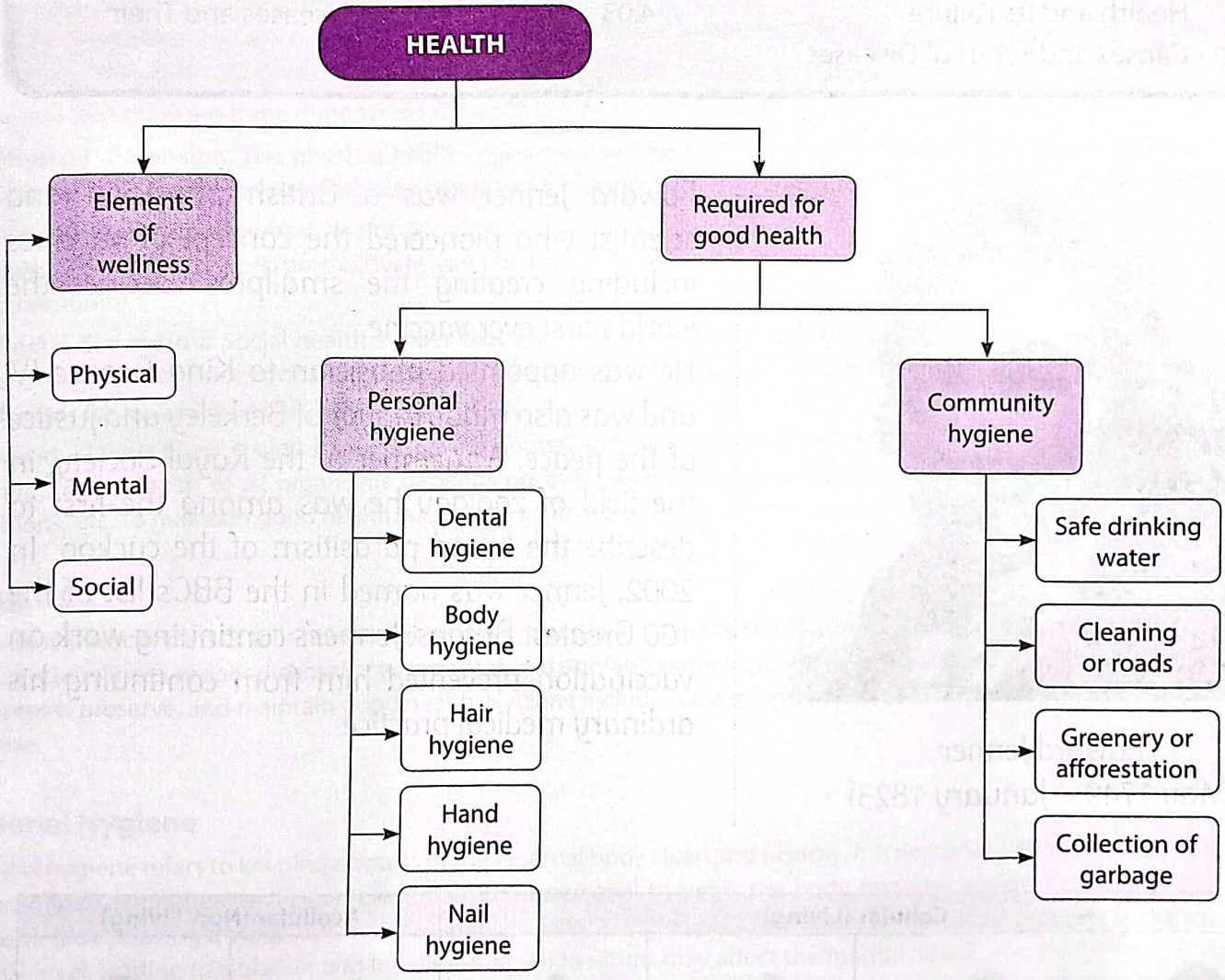
Edward Jenner was a British physician and scientist who pioneered the concept of vaccines including creating the smallpox vaccine, the world's first ever vaccine.

He was appointed physician to King George IV, and was also made mayor of Berkeley and justice of the peace. A member of the Royal Society, in the field of zoology he was among the first to describe the brood parasitism of the cuckoo. In 2002, Jenner was named in the BBC's list of the 100 Greatest Britons. Jenner's continuing work on vaccination prevented him from continuing his ordinary medical practice.

Cellular (Living)				Acellular (Non-Living)	
					
Parasites	**Protozoa**	**Fungi**	**Prokaryote**	**Virus**	**Prion**

4.01 Health and Its Failure

MIND MAP



INTRODUCTION

The maintenance of good health is very important for every individual and its importance has been promoted for centuries. For an individual to be healthy, he must be physically, mentally as well as socially fit. Thus, it is said that *Health is Wealth*.

As discussed in previous chapters, we know that human body is made up of cells. A cell is the basic structural and functional unit of all living organisms. This living cell is a dynamic entity which is involved in various functions. Cells with similar functions organize to form tissues and organs and finally the organ systems. These tissues or organs

of human body perform many specialized activities. For example, heart pumps blood to all parts of the body, the expansion and contraction of lungs while breathing provides oxygen to the body cells and simultaneously removes carbon dioxide out of the body, filtration of blood by kidneys to form urine, etc. All these activities are interconnected. Therefore, anything that prevents proper functioning of the cells or organs will lead to improper activity of the organ system, hence leading to a diseased state.

HEALTH

Health of any living organism is maintained by proper intake of nutritious food. This helps the species to not only survive but also maintain proper functioning of organs for their growth, reproduction, and development.

In 1948, the World Health Organization (WHO) defined health as a complete state of physical, mental, and social well-being and not merely an absence of disease or infirmity.

This implies that there are three dimensions of health:

(i) **Physical dimension:** The physical health implies perfect functioning of all the body parts, organs, and organ systems. This can be determined when there are no symptoms of disease and anxiety or no physical deformity.

(ii) **Mental dimension:** Mental health is defined as a state of well-being in which an individual can realize his own potential, can work productively, can cope with the stress of life, and is able to make contribution to the community.

(iii) **Social dimension:** Social health implies that every person living in a society possesses basic needs of life, i.e., a clean place of living, good earning, good food, a happy family, cooperative interaction with neighbours and friends for leading a happy and purposeful life.

An individual with good health is said to have a normal and healthy state of the body. It is a great source of peace and happiness. Health of all organisms depends on their personal hygiene, physical environment, socioeconomic conditions, etc. To maintain good health, an individual needs to follow certain good practices that prevent disease.

HYGIENE

Hygiene is the science that tells how to follow good practices that prevent disease and lead to good health, especially through cleanliness, proper disposal of wastewater, and drinking water supply. It refers to all the activities that are done to improve, preserve, and maintain good health. Hygiene includes two things: (i) personal hygiene and (ii) community hygiene.

Personal Hygiene

Personal hygiene refers to keeping all parts of the external body clean and healthy. It is important for maintaining both physical and mental health. If people maintain poor personal hygiene, the body provides an ideal environment for germs to grow, leaving it vulnerable to infection. Secondly, people may avoid a person with poor personal hygiene on a social level, leading to isolation and loneliness which in return may affect the mental health. The act of maintaining cleanliness and grooming of the external body is a must for every individual. It includes bathing, washing your hands, brushing teeth, and sporting clean clothing.

DEVELOP

Practices to Maintain Personal Hygiene

It includes activities that an individual undertakes to promote his or her health. Poor personal hygiene is another factor responsible for several diseases and infections. Personal hygiene can be categorized into following different types:

(i) **Dental Hygiene:** Dental hygiene refers to proper oral care. This means to have not only white teeth but also prevent bad breath by maintaining healthy teeth, free of bacteria. It can be achieved by following these practices:

(a) Regular brushing of teeth for two minutes at least twice a day—once before breakfast and once before bed.

(b) People should use an ADA-approved fluoride toothpaste and replace the toothbrush every 3–4 months. The ADA also advise people to floss daily.

(ii) **Body Hygiene:** The body hygiene is achieved majorly by bathing. Bathing is an activity that promotes personal hygiene by cleaning the body, killing the germs as well as controlling the bad odour. Hence, body hygiene can be achieved by following these practices:

(a) Take shower or bathe daily, using soap and water to rinse away dead skin cells, oil, and bacteria.

(b) People need to pay special attention to areas that accumulate more sweat, such as the armpits, in between the toes, and the groin area.

(c) People also need to wash their hair with shampoo at least once a week, or more if necessary.

(d) Applying deodorant when fully dry can help prevent body odour.

(e) Avoid sharing towels to prevent infections.

(f) Clothes and undergarments must be clean and dry to prevent skin infection and rashes.

(g) Avoid wearing tight-fitting clothes as it may interfere with blood circulation, respiration, and digestion.

(h) Avoid uncomfortable footwear to protect your feet from injuries.

(iii) **Hair Hygiene or Care:** Hair hygiene mainly refers to washing and combing hair that is essential to keep our hair clean, healthy and free from dandruff and parasites like lice. Hair hygiene can be maintained by following these practices:

(a) Use an organic shampoo and conditioner. Shampoo needs to be diluted before use.

(b) In case of dandruff and parasites like lice, apply related hair care products regularly to reduce their effect. In case of severity, consult a doctor.

(c) Avoid sharing combs to prevent infections.

(iv) **Nail Hygiene:** Nail hygiene is the most essential care in personal hygiene as it prevents spread of germs. To maintain hygiene of nails, following practices need to be followed:

(a) Keep nails short and trim them often.

(b) Scrub the underside of nails with soap and water (or a nail brush) every time you wash your hands.

(c) Avoid biting or chewing nails.

(d) Clean the nail grooming tools before use and take care that the tools are clean and sanitized.

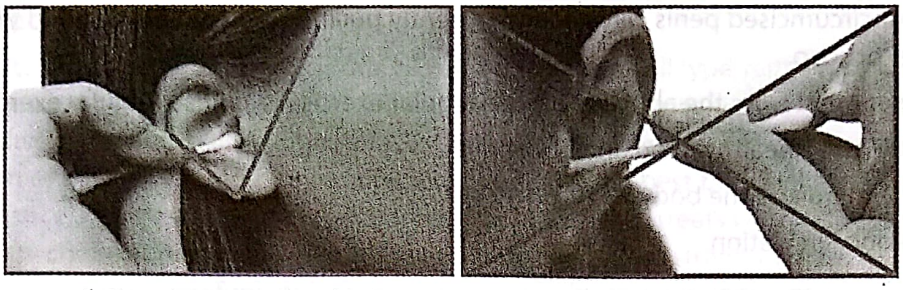
(e) Avoid cutting cuticles, as they act as barriers to prevent infection.

Key point

Nail infections of the fingernails or toenails are often characterized by swelling of the surrounding skin, pain in the surrounding area or thickening of the nail. In some cases, these infections may be serious and need to be treated by a physician.

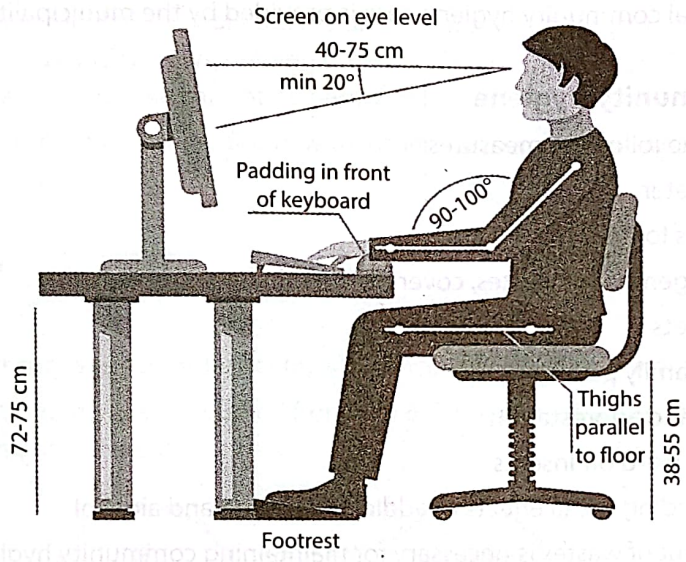
(v) **Eyes and Ears Hygiene:** Both eyes and ears are the sense organs of our body, and their hygiene is essential in our life.

(a) Ears accumulate wax, and if neglected it may lead to infections. Hence, they should be maintained in a clean condition. Their care includes regular cleaning with ear buds. Pointed objects like pencils, pins or pens should be never used to clean ears to avoid injury to the eardrums.



✓ Cleaning outside of Ear × Cleaning inside of Ear

(b) Eye care should be practised which includes washing the eyes with cold water, reading and writing in proper light while keeping the book at a distance of about 25 centimetres, watching TV or a computer screen from a distance of 8–10 feet. The correct posture to sit and watch computer should be followed.



(vi) Hand and Foot Hygiene: Hand and foot care are also a part of personal hygiene. This is done to keep them free from dust and germs. For this, following practices need to be followed:

(a) Feet should be washed properly to prevent infection along with nail care.

(b) Regular hand washing is one of the best ways to avoid spreading communicable diseases. Hands must be washed at certain times like:

- Before, during and after preparing food or before eating food
- Before and after treating a cut or wound
- After using the toilet and handling dirty objects, after changing diapers or cleaning up a child who has used the toilet
- After blowing the nose, coughing or sneezing, or touching garbage or dirty surfaces or objects
- After handling pets or pet-related items.

(vii) Menstrual and Genital Hygiene: In terms of menstrual hygiene, it is important for an individual to change their sanitary products regularly and to wash the hands before and after changing tampons, pads or any other sanitary products.

As vaginas are self-cleaning, using soap to clean the vagina can cause an imbalance of its natural bacteria and lead to infections. The vulva (the external part of the vagina) should only need cleaning once a day using a mild soap and water.

People with an uncircumcised penis can clean it by gently pulling back the foreskin and washing underneath it with warm water or soap.

(viii) Physical Exercise: Apart from the above practices, regular exercise is a must. Regular exercise

(a) Helps to maintain a healthy mind and body

(b) Activates the mind and the body

(c) Improves blood circulation

Community Hygiene

The environment in which we live plays a very important role in keeping us healthy. Community hygiene is the cooperative effort to bring greater health and prevention of disease to a group of people living near one another. This helps as a foundation to social progress of a country. Community hygiene is the proper maintenance of the surroundings and neighbourhood. The general community hygiene care is provided by the municipalities and panchayats.

Practices to Maintain Community Hygiene

Community hygiene involves the following measures:

(i) Supplying safe drinking water

(ii) Maintenance of open areas for fresh air

(iii) Proper disposal and management of wastes, covering dustbins

(iv) Cleaning of roads and streets

(v) Managing population by family planning

(vi) Maintenance of greenery and afforestation

(vii) Spraying of insecticides to ward off insects

(viii) Spreading awareness regarding the ill effects of addiction to drug and alcohol

Proper disposal and management of wastes is necessary for maintaining community hygiene:

(i) Timely collection of garbage

(ii) Construction and maintenance of sewage pipes and drains

(iii) Development of parks and gardens on the dumping grounds

(iv) Management of wastes, which involves processing of wastes generated from different sources

(v) Processing of wastes can be done in two different ways such as composting and vermicomposting. The vegetable and fruit peels and the excreta of animals are dumped into pits and covered by soil. The microorganisms present in the soil convert them into manure, this process is called composting.

Differences Between Healthy and Disease-free State

Although the terms disease-free and healthy sound similar, they do not convey the same meaning.

Disease-free State: A person is considered free from disease if he does not have any discomfort in the functioning of the body. If a person is not suffering from fever, it does not mean that he is healthy. For example, if a person is suffering from any kind of mental stress, then also he is said to be unhealthy.

Healthy State: A healthy individual is the one who is in a state of physical, social, and mental well-being. It depends on many factors such as emotional, intellectual, social, economic, spiritual and other areas of life. Healthy state refers not only to the individual but also its social and community environment.

Other Factors Affecting Health

Physical Environment: Physical environment includes light, temperature, soil type, rainfall etc. Our social environment is also an important factor in our individual health. We live in villages, towns or cities. In such places, even our physical environment is decided by our social environment. If public health services or community health services are inadequate, the health of citizens is bound to be affected despite taking best personal hygiene and consuming the balanced diet. For instance, if there is a great deal of garbage thrown in the streets which is not regularly collected and disposed off, or there are choked open drains with stagnant water lying in the streets or open spaces where we live, the chances of poor health increase. Therefore, public cleanliness and physical environment are important for individual health.

Economic Conditions: Proper earning is necessary to provide adequate and nutritious food to everyone in the family. Thus, job opportunities also need to be available in the societies where we live. In other words, good economic conditions and jobs are necessary for individual health.

Social Equality and Harmony: Similarly, social equality and harmony are necessary for individual health. It involves participation in one another's joys and sorrows, helping others and receiving help at the time of need, etc. If we mistreat each other and are afraid of each other, we cannot be happy or healthy.

Thus, both personal and community issues along with other factors play an important role in determining an individual's health.

ACTIVITY

Aim: To identify the correct sequence or order of steps to be followed during hands wash.

Method: Given below are eight images, numbered from 1 to 8. Study these images and arrange them in the correct order as it is followed during hands wash.

1. 
Back of hands

2. 
Palm to palm

3. 
Wrists

4. 
Base of thumbs

5. 
Between fingers

6. 
Back of fingers

7. 
Rinse and wipe dry

8. 
Fingernails

Result: The correct order of images is 2 → 5 → 1 → 4 → 6 → 8 → 3 → 7

Palm to palm | Between fingers | Back of hands | Base of thumbs

Back of fingers

Fingernails

Wrists

Rinse and wipe dry

MISCONCEPTION

Being in poor health means he is suffering from a disease.

FACT: Being in poor health is different from being diseased. A person may not be suffering from any disease but may be in poor health. Poor health refers to condition or inability to perform the physical, mental or social functions effectively. There could be various reasons for it. This is also true in case where an individual show poor social and mental health, without there being a cause of any actual physical disease. Hence, it can be concluded that when an individual suffers from a disease, he shows poor health while a disease-free person can also have poor health.

EXAMPLES

1. State three differences between 'healthy' and 'disease-free' state.

Solutions: The three differences between 'healthy' and 'disease-free' state are:

	Healthy	Disease-free
(i)	It is a state of physical, mental, and social well-being.	It is a state of absence of any discomfort or derangement of the functioning of the body.
(ii)	It refers not only to the individual but also its social and community environment.	It refers to the individual.
(iii)	A 'healthy' individual is one who can perform normal under given situation.	A 'disease-free' individual may not perform normal under a given situation.

2. State any two conditions essential for good health.

Solution: The two conditions essential for maintaining good health are:

(i) Proper nutrition and balanced diet

(ii) Good hygiene and regular exercise

3. Are the essential conditions for good health or for being free of disease necessarily be the same or different?

Solution: Answers to both questions are interconnected. To some extent they are same, because conditions that are essential for good health, if maintained, automatically minimizes the chances of getting a disease. But at the same time, it can be said that they are different because being healthy refers to physical, mental and social well-being while being disease-free means absence of suffering or discomfort due to any disease.

4. How can you differentiate between symptoms and signs of diseases?

Solution: The differences between symptoms and signs of diseases are:

Symptoms	Signs
1. It is a manifestation of disease apparent to the patient himself.	1. It is a manifestation of disease that the physician perceives.
2. It is a subjective evidence of a disease.	2. It is an objective evidence of a disease.
3. Symptoms represent the complaints of the patient, and if severe, they drive him to a doctor. For example, if the patient notices the rash, it is a symptom.	3. If the doctor, nurse or anyone other than the patient notices the rash, it is a sign.

5. List some signs of physical health.

Solution: If you have good physical health, the following signs of physical health are observed:

(i) The individual shall be energetic and alert.

(ii) They have weight which is normal for their age and height.

(iii) They have bright and shining eyes.

(iv) They have good appetite.

(v) They have all the body organs functioning normally and rarely fall sick.

(vi) They have clean and clear skin.

(vii) They have normal growing hair of natural colour and texture.

RECALL

1. **Health** is defined as a complete state of physical, mental, and social well-being, and not merely the absence of disease or infirmity.
2. **Personal health** refers to overall well-being of an individual. It is the ability of an individual to take charge of his health by making conscious decisions to be healthy.
3. The wellness of an individual depends on many factors such as emotional, intellectual, social, economic, spiritual, and other areas of life.
4. **Hygiene** refers to a set of practices of keeping yourself and the surroundings clean to maintain health and prevent illness or spread of diseases.
5. **Personal hygiene** is defined as an act of maintaining cleanliness and grooming of the external body. It includes bathing, washing your hands, brushing teeth and sporting clean clothing, etc.
6. Regular exercise is must to maintain a healthy mind and body. It also activates the mind and the body and improves blood circulation.
7. Proper sleep and rest are other important factors needed to maintain a healthy mind and body.
8. **Community hygiene** refers to the proper maintenance of the surroundings and neighbourhood.

DESCRIPTIVE QUESTIONS

I. VERY SHORT ANSWER QUESTIONS

1. Define the term health.
2. What is hygiene?
3. What is personal health?
4. On what factors does the wellness of an individual depend?
5. How can an individual take proper care of his eyes?
6. Name any two practices that are included in personal hygiene.
7. Anil wants to take care of his personal health. What things he must practice on regular basis apart from hygiene?
8. What practices can be followed by every individual for maintaining a good health?
9. What is pathology?
10. In an apartment, the society decided to maintain proper garbage and sewage disposal. What kind of hygiene practice it refers to?

II. SHORT ANSWER QUESTIONS

11. Give the importance of exercise.
12. State any five practices an individual can follow to maintain a good personal hygiene.
13. What practices can be followed to maintain community hygiene?
14. Sleep and rest is an important practice to be followed for maintaining good health. Explain.

III. LONG ANSWER QUESTIONS

15. What measures does the municipalities and panchayats take to maintain general community health?
16. Explain why the proper disposal and management of wastes is necessary for maintaining community hygiene.

IV. FILL IN THE BLANKS

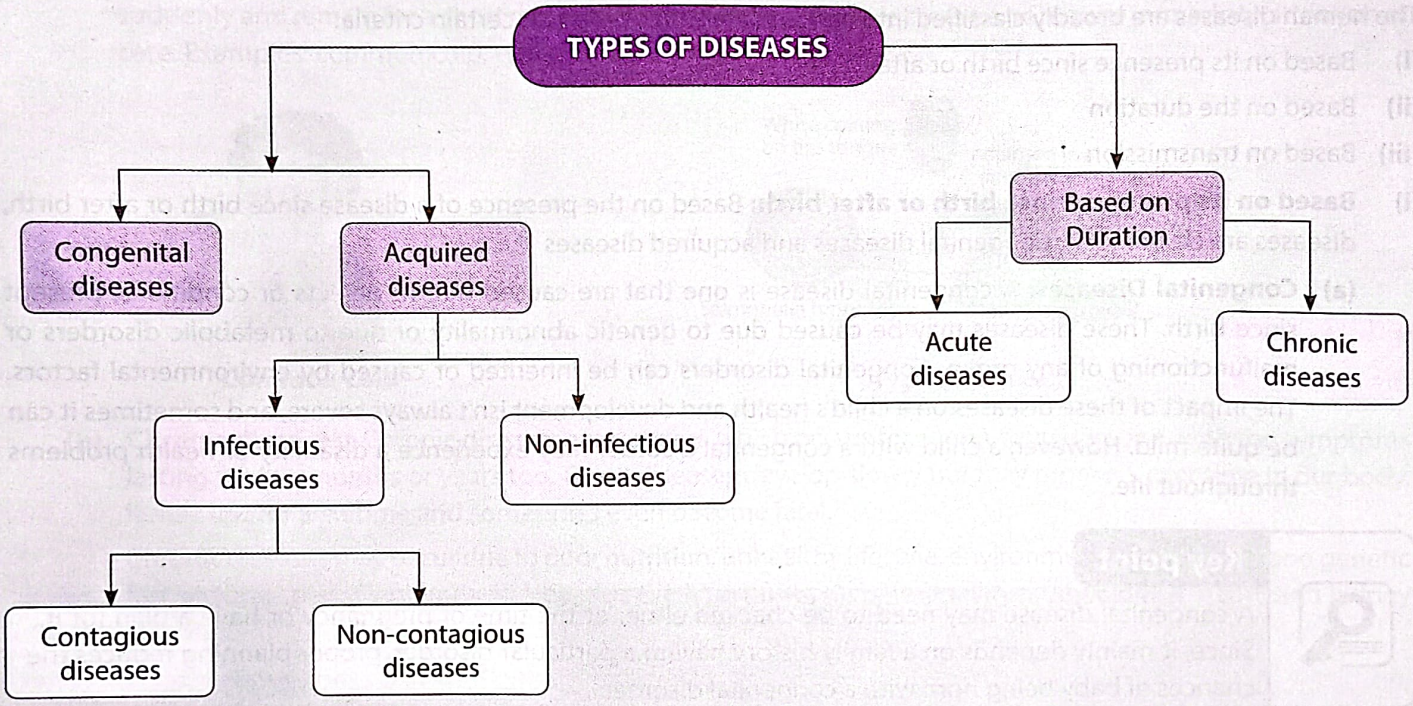
17. Spraying _____ at regular intervals wards off insects.
18. _____the hands before and after eating.
19. An individual can maintain a good health by taking care of _____.
20. Improperly prepared food can cause _____.
21. The two types of hygiene are _____ and _____ hygiene.
22. In a society, the proper disposal of garbage is a _____ hygiene.

V. TRUE OR FALSE

23. Community hygiene includes proper maintenance of greenery and afforestation.
24. One of the good eye care practice is reading and writing in proper light from an appropriate distance.
25. Personal hygiene is providing safe drinking water.
26. Regular bathing and laundering are important only for good personal appearance.
27. Physical and social environment play an important role in maintaining a bad health.
28. Regular sleep and relaxation help in the repair of body tissues.
29. Community health centres do not provide safe and germ-free drinking water.
30. Eating without washing one's hand is a healthy habit.

4.02 Causes and Types of Diseases

MIND MAP



INTRODUCTION

A person is said to be healthy or in good health only when he has no disease. A disease is a disorder that affects health by affecting an organism's body, organs, tissues, or cells. It influences human health and therefore, disease has always been one of the major driving forces of biological research.

DISEASE

A disease is a discomfort, or some uneasiness felt by an individual caused by a disturbance in normal functioning of the body. The disease may affect a part of or entire organ system, and sometimes even the total body system. Disease may or may not necessarily give a pain sensation.

Diseases can be either physical, mental, infectious, or non-infectious in nature, inherited, or degenerative. They may be life threatening or fatal, resulting in death. Proper diagnosis and medication are required for proper treatment of diseases.

Diseases are often associated with certain signs and symptoms. These signs or symptoms are used to diagnose a particular disease. Disruption in the functioning of a tissue, organ or organ system will cause discomfort or disease. As disruption is internal, the reason of the disease cannot be known immediately. In the presence of a disease, functioning or appearance of one or more organ systems of the body changes. These changes give rise to symptoms and signs of the disease, based on which a disease is diagnosed.

Symptoms are the manifestations or evidence of the presence of disease(s). They indicate that there is some abnormality in the body. For instance, we have headache or cough or loose motions or wound with pus. All these are symptoms of some disease(s). Headache may occur due to day's heavy work or problem of eyesight or blood pressure or it may occur due to number of diseases, e.g., malaria, typhoid, jaundice, etc. Symptoms do not give any exact cause of the disease.

Signs are defined as indications of the disease. Based on the symptoms, physicians search for definite clues or signs of the disease.

Classification of Diseases

The human diseases are broadly classified into various categories based on certain criteria:

(i) Based on its presence since birth or after birth

(ii) Based on the duration

(iii) Based on transmission

(i) **Based on its presence since birth or after birth:** Based on the presence of a disease since birth or after birth, diseases are classified as: Congenital diseases and acquired diseases

(a) **Congenital Diseases:** A congenital disease is one that are caused due to defects or conditions, present since birth. These diseases may be caused due to genetic abnormality or due to metabolic disorders or malfunctioning of any organ. Congenital disorders can be inherited or caused by environmental factors. The impact of these diseases on a child's health and development isn't always severe, and sometimes it can be quite mild. However, a child with a congenital disorder may experience a disability or health problems throughout life.

Key point

A congenital disease may need to be checked either at the time of pregnancy or have a plan for it. Since, it mainly depends on a family history having a particular disorder, proper planning reduces the chances of baby being born with a congenital disorder.

DEVELOP

Congenital diseases develop in terms of structural or physiological deformities, in the foetus during pregnancy or intrauterine life.

Reasons for the development of congenital diseases:

(i) **Gene defects:** These defects are inherited from parents to their children. Examples: sickle cell anaemia, haemophilia.

(ii) **Chromosomal abnormalities:** These abnormalities are caused due to the error in the total number of chromosomes of the foetus which may have resulted due to a fault during gametogenesis. Example: Down's syndrome, developed due to chromosomal abnormality.

(iii) **Teratogens:** These are substances present in the environment which may lead to structural deformities or other abnormalities in the children following foetal exposure during pregnancy. Examples: smoking, alcohol, Thalidomide (a teratogen that causes deformities in the limbs of the foetus).

Thalidomide deformity

(b) Acquired Diseases: These are the diseases that an individual develops after birth, during their life span. These types of diseases are related to pathogen infections, ageing or climatic changes. Examples of acquired diseases are salmonella infections, AIDS/HIV infections, influenza, malaria, cancer, norovirus infections, etc.

Types of Acquired diseases: Acquired diseases can again be classified into two types:

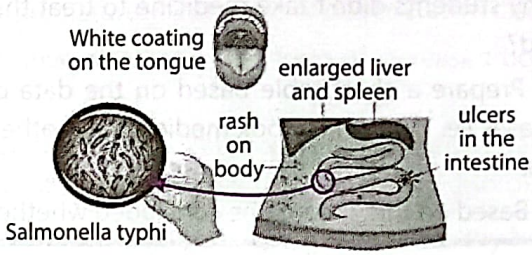
(i) Infectious or communicable diseases

(ii) Non-infectious or non-communicable diseases

(ii) Based on the Duration: A disease can occur either for a short duration or may occur for long time. According to their prevalence in human body, they are classified as: acute diseases and chronic diseases.

(a) Acute diseases: These are the type of diseases which occur for a short interval of time. Acute diseases appear suddenly and remain for a short duration, but their symptoms are severe and require immediate attention or care. Examples: common cold, typhoid, jaundice, cholera, burns.

Common cold



Typhoid fever

(b) Chronic diseases: Chronic diseases are diseases which occurs for a long-term duration, with the symptoms lasting for few months or years too. These diseases develop slowly but may progress over time in our body. It may last for a lifetime and sometimes even become fatal.

Chronic diseases may occur due to poor nutrition, unhealthy lifestyle, environmental, social, age, and genetic factors. Examples: Elephantiasis, Hepatitis C, HIV, arthritis, diabetes mellitus, tuberculosis, heart, and kidney diseases.

Key points

Chronic diseases can be controlled by:

(i) Indulging in physical activity

(ii) Consuming healthy and nutritious diet

(iii) Refraining from smoking and drugs

(iv) Reducing alcohol consumption

MISCONCEPTION

Common cough and cold is a chronic disease.

FACT: Common cough and cold is an acute disease as it appears suddenly and has no bad effect on our health, as it lasts for a very short time. Since they do not last longer, they will not have much time to cause major effects on general health, as compared to a chronic disease that affects health drastically.

ACTIVITY

Aim: To find out whether the common cold, cough or fever is an acute or chronic disease and how did it affect individuals.

Procedure: Consider a sample size of 10 – 15 individuals to carry out this activity. You can also do this activity by dividing the students of your class into 2 – 3 groups. Then prepare a chart for your observations based on following questions.

(i) Number of students affected due to cold/ cough/ fever

(ii) How long did the cold/ cough/ fever last in them (average days)?

(iii) How many students did take medicine for it? If yes, how long they took for complete recovery?

(iv) How many students didn't take medicine to treat themselves? If yes, how long they took to get completely recovered?

Observation: Prepare a chart/table based on the data collected from above questions and compare the two groups in all cases i.e., one which took medicine and other which didn't. Find out the average time of recovery in both the cases.

Conclusion: Based on this, it could be concluded whether cold/ cough/ fever is an acute or chronic disease.

MISCONCEPTION

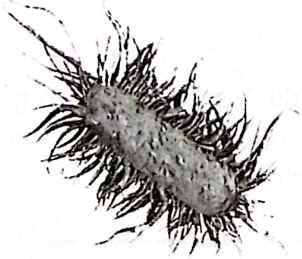
A disorder of body function associated directly with any external injury is also a disease.

FACT: A disorder of body function associated directly with any external injury is not considered as a disease. For example, a fracture in a bone caused due to an accident, cannot be considered as a disease.

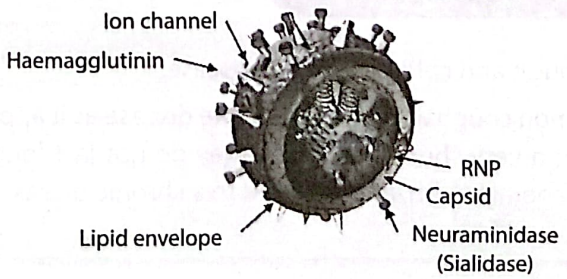
(iii) Mode of Transmission/spread: Based on the spread or mode of transmission, diseases can be classified into infectious and non-infectious diseases.

(a) Infectious diseases: The diseases that are spread or transmitted from one person to another through various mediums are called infectious or communicable diseases. These diseases are usually caused by different microorganisms called pathogens. Disease causing pathogens may vary from bacteria, viruses, fungi, protozoans, and parasitic worms. When an infected person discharges bodily fluids, pathogens may exit the host body and infect a new person (through sneezing, coughing, etc.). Examples: cholera, chickenpox, malaria, etc.

(b) Non-infectious diseases: The diseases that are not spread or transmitted from one person to another are called non-infectious or non-communicable diseases. A non-communicable disease is usually caused by lifestyle or genetic abnormalities. These diseases are also caused by other factors such as age, nutritional deficiency, gender of an individual. They do not spread to others and they restrain within a person who has contracted them. Examples: Alzheimer's, asthma, cataract, hypertension, diabetes, cancer, and heart diseases.



Salmonella



Influenza virus

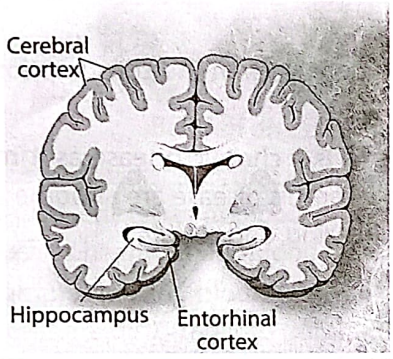
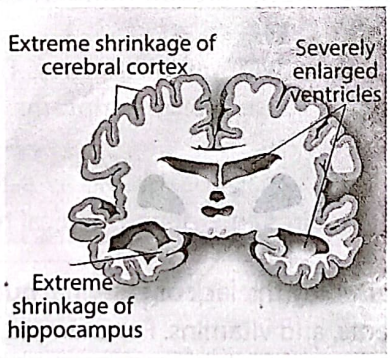
DEVELOP

Types of Non- communicable diseases

Non- communicable or non-infectious diseases may again be classified into various categories, based on certain factors responsible for their cause.

(i) **Degenerative Diseases:** In the human body, the malfunctioning of vital organs results in the deterioration of cells over time. Degenerative diseases are the result of a continuous process based on degenerative cell changes, affecting tissues or organs, which increasingly deteriorate over time. Degenerative diseases are usually caused by ageing. Others are caused by lifestyle choices and some are hereditary. Ageing is a natural phase in human life. Human body tends to undergo and accumulate changes over time which are usually degenerative at the cellular level. This deterioration of cells affects the function and structure of the affected body part, thus causing disability, mortality, and morbidity, which may occur prematurely. Examples of degenerative diseases are:

- **Osteoporosis** shows characteristics of degenerative diseases in the form of increased bone weakness. It increases the risk of bone fractures.
- **Alzheimer's** is a prominent example of degenerative disease. This occurs due to degeneration of neurons, cells of the central nervous system. This condition is termed as a neurodegenerative disorder.

	In the given diagram (left), a healthy brain is shown.
	In the given diagram (left), the brain of Alzheimer's patient is shown. The brain with Alzheimer's disease condition shows an extreme shrinkage in various brain regions due to the death of neurons. Thus, the brain function is greatly impaired.

Key points

- We know that the immune system protects us from pathogens. But there are chances that at times, the immune system itself can develop problems.
- For example, at times the body's immune system responds to harmless foreign substances, as they were pathogens. As a result, the immune system attacks the body's own cells.
- There are even certain diseases in which the immune system attack and damage its own immune cells and interfere with its ability to defend the body. Such diseases are called autoimmune diseases.

(ii) **Allergies:** An allergic reaction arises when the body becomes hypersensitive to certain foreign substances called allergens. This allergic reaction leads to a disease in which the immune system makes an inflammatory response to a harmless antigen. Allergens may be inhaled or ingested, or they may even come in contact with the skin. Some allergens are discussed below:

- The two common allergens are ragweed pollen and poison ivy. Inhalation of ragweed pollen may cause coughing and sneezing, while coming in close contact with poison ivy (skin contact with oils in poison ivy) may cause an itchy rash.

Ragweed

Poison Ivy

- Other common causes of allergies include dust mites, mold, animal dander, insect stings, latex, and certain food and medications.
- Peanuts and few other nuts also have the capability to cause severe allergic reactions in some that may induce life-threatening conditions. Since these allergens cause difficulty in breathing; tissues swell up and block the airways causing anaphylaxis shock.
- The bee stings and ant bites also trigger allergies. In some people, even the consumption of shellfish and certain medications can induce allergic reactions.

Asthma is one of the best examples of allergic reaction. Asthma is a chronic disease as it mainly affects the bronchi and bronchioles of the lungs. The key factor responsible for this disease are airborne allergens such as pollens or dust. The symptoms include difficulty in breathing, wheezing, and cough.

Key points

- Symptoms of a common allergy such as pollen can include sneezing, a runny nose, nasal congestion, and itchy, watery eyes.
- **Antihistamines:** Mild allergy symptoms are often treated with antihistamines. These are drugs that reduce or eliminate the effects of the histamines that cause allergy symptoms. The histamines basically trigger the inflammatory response.
- **Anaphylaxis:** The most severe allergic reaction is called anaphylaxis. This is a life-threatening response caused by a massive release of histamines. It requires emergency medical treatment.

(iii) **Deficiency diseases:** Deficiency disease is a disease which is caused by the lack of essential nutrients or dietary elements in the human body such as hormones, minerals, nutrients, and vitamins. For example, diabetes occurs due to an inability to produce or utilize insulin, goiter, is mainly caused by iodine deficiency, kwashiorkor is caused by a lack of proteins in the diet. Vitamin B1 deficiency causes beriberi.

Goiter

Goiter is an abnormal enlargement of the thyroid gland. The thyroid is a butterfly-shaped gland located at the base of the neck, just below the Adam's apple. A goiter is caused due to the blocking of oesophagus or other organs of the chest and neck. Although goiters are usually painless, a large goiter can cause coughing, difficulty in swallowing or breathing (due to squeezing of windpipe and oesophagus).

Goiter

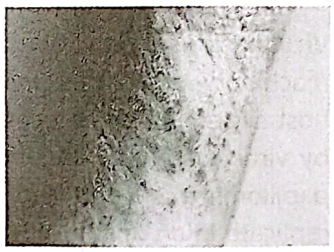
The main symptoms of goiter include:

- A swelling in the front of the neck, just below the Adam's apple
- A feeling of tightness in the throat area
- Hoarseness (scratchy voice)
- Neck vein swelling
- Dizziness when the arms are raised above the head

Vitamin Deficiency: The deficiency of vitamins in humans is a condition that is caused due to long-term deficiency of certain vitamins in our body.

- If any individual has less intake of vitamin, then the condition is called primary deficiency.
- If the reason behind deficiency is malabsorption of vitamins due to a disorder, it is called secondary deficiency.
- The deficiency of vitamins leads to diseases like beriberi and pellagra.

BeriBeri disease



Pellagra

(iv) Blood Diseases: The diseases that are related to blood disorders are called as blood diseases. The people may get affected by different types of blood conditions. The most common blood disorders include anaemia, bleeding disorders such as haemophilia, blood clots, and blood cancers such as leukemia, lymphoma, and myeloma.

- For example, the red blood cells are destroyed when a person contracts the sickle cell anaemia. The red blood cells are distorted into the shape of a sickle (hence, the name) and it loses its ability to carry oxygen.
- Other blood diseases include eosinophilic disorders, leukemia, myeloma (cancer of plasma cells in bone marrow), sickle cell anaemia, aplastic anaemia, hemochromatosis and Von Willebrand disease (blood-clotting disorder).

Differences between infectious and non-infectious diseases

Infectious or Communicable Diseases	Non-infectious or Non-communicable Diseases
1. They are caused by attack of pathogens.	They are not caused by pathogens.
2. The diseases are caused due to extrinsic or external factors.	The diseases are mostly caused due to intrinsic or internal factors
3. Infectious diseases can pass from diseased person to a healthy person.	Non-infectious diseases cannot pass from one person to another.
4. Transmission of infection occurs through direct contact or some medium (air, water, or vectors)	Transmission of disease is absent. However, hereditary diseases are transmitted or inherited from parents to offspring.
5. Community hygiene can reduce the incidence of infectious diseases.	Community hygiene is ineffective in reducing the incidence of non-infectious diseases
6. Examples include cholera, tuberculosis, pneumonia, chickenpox	Examples include blood diseases, deficiency diseases, genetic abnormalities, cancer etc.

Disease-Causing Agents

The diseases that are caused by different microorganisms or pathogens can be classified as diseases based on the causative agents such as bacteria, fungi, viruses etc. Some diseases are also caused by **multicellular organisms** such as worms.

Key points

- **Pathogens:** Pathogens are external agents that cause diseases in other organisms. The pathogen includes harmful microbes or microorganisms such as bacteria, virus, fungi, or protozoa.
- **Vector:** Vectors are those organisms that carry a pathogen from the host to a recipient. Mosquito, rats, and mice are some of the common vectors that carry infectious diseases.
- **Bacteria:** Bacteria are microorganisms that are seen in almost all environmental conditions. Not all bacteria are harmful or pathogens. Some bacteria are also beneficial to human beings. Bacteria are beneficial for digestion, nitrogen fixation, and commercially in extraction of antibiotics from them, etc.
- **Virus:** A virus is a microorganism that is always pathogenic in nature. They do not have their own machinery to replicate and multiply. Therefore, they enter the host cell and multiply using the host system. In this process, the host cells are destroyed. Few of the common diseases spread by viruses are cold, influenza, dengue fever, AIDS, etc. There are few viruses, such as human papillomavirus (HPV) and Epstein-Barr virus (EBV) that can lead to cancer by forcing cells to replicate in an uncontrolled way. COVID-19, a respiratory disease also develops due to a novel coronavirus infection that is currently causing a global pandemic.
- **Fungi:** Fungi are a group of eukaryotic organisms which are saprophytic in nature. They could be either unicellular or multicellular organisms. Those with a higher risk of developing a fungal infection include people who use antibiotics for a long time. Examples of fungal infections are valley fever, coccidioidomycosis, histoplasmosis candidiasis, athlete's foot, ringworm, some eye infections. A rash also may indicate a fungal infection of the skin.

Some diseases and their disease-causing agents

Disease	Causative Agents
Plague	*Pasteurella pestis*
Cholera	*Vibrio comma (Vibrio cholera)*
Tetanus	*Clostridium tetani*
Anthrax	*Bacillus anthracis*
Whooping cough	*Bordetella pertussis*
Human papillomavirus infection	*Human papillomavirus*
Acquired Immune Deficiency Syndrome (AIDS)	*Human Immunodeficiency Virus* (HIV)
Hepatitis	Hepatitis A, Hepatitis B, Hepatitis C, Hepatitis D, Hepatitis E viruses
Chickenpox	Varicella zoster virus (VZV)
Meningoencephalitis	*Naegleria fowleri* (brain-eating amoeba)

EXAMPLES

1. What are acute diseases? Explain with examples.

Solution: Acute diseases are the ones which appear in our body suddenly with some distinct symptoms and require immediate care. These are the diseases which occur for a short interval of time. Acute diseases appear suddenly and remain for a short duration, but their symptoms are severe and require immediate attention or care. Examples: common cold, typhoid, jaundice, cholera, burn. For instance, a broken leg bone that might take place from a fall, must be treated immediately by a doctor. This broken bone need immense care and will heal with time and care. Similarly, cold, cough and fever can also be termed as acute diseases as these disease get treated soon, if taken proper care at right time.

2. Write a short note on goiter.

Solution: Goiter is an abnormal enlargement of the thyroid gland. The thyroid is a butterfly-shaped gland located at the base of the neck, just below the Adam's apple. A goiter is caused due to the blocking of oesophagus or other organs of the chest and neck. Although goiters are usually painless, a large goiter can cause coughing, difficulty in swallowing or breathing (due to squeezing of windpipe and oesophagus).

3. Why are the plants ragweed and poison ivy considered as allergens?

Solution: Inhalation of ragweed pollen may cause coughing and sneezing, while coming in close contact with poison ivy (skin contact with oils in poison ivy) may cause an itchy rash. Since both these plant products trigger a hypersensitive reaction in individuals, they are considered allergens. The symptoms of these allergens may vary from mild to severe.

4. How are chronic diseases controlled?

Solution: Chronic diseases can be controlled by:

(i) Indulging in physical activity

(ii) Consuming healthy and nutritious diet

(iii) Refraining from smoking, and drugs

(iv) Reducing alcohol consumption

5. State the effect of degenerative diseases on humans.

Solution: In the human body, the malfunctioning of vital organs results in the deterioration of cells over time. Degenerative diseases are the result of a continuous process based on degenerative cell changes, affecting tissues or organs, which increasingly deteriorate over time. Degenerative diseases are usually caused by ageing and bodywear. Others are caused by lifestyle choices and some are hereditary. Ageing is a natural phase in human life. The human body tends to undergo and accumulate changes over time which are usually degenerative at the cellular level. This deterioration of cells affect the function and structure of the affected body part, thus causing disability, mortality, and morbidity, which may occur prematurely. Examples of degenerative diseases are:

- **Osteoporosis** shows characteristics of degenerative diseases in the form of increased bone weakness. It increases the risk of bone fractures.
- **Alzheimer's** is a prominent example of degenerative disease. This occurs due to degeneration of neurons, cells of the central nervous system. This condition is termed as a neurodegenerative disorder.

RECALL

1. A disease is a discomfort, or some uneasiness felt by an individual caused by a disturbance in normal functioning of the body.
2. **Symptoms** are the manifestations or evidence of the presence of disease(s), indicating that there is some abnormality in the body. They do not give any exact cause of the disease.
3. **Signs** are defined as indications of the disease. Based on the symptoms, physicians search for definite clues or signs of the disease.
4. A congenital disease is one that are caused due to defects or conditions, present since birth. These diseases may be caused due to genetic abnormality or due to metabolic disorders or malfunctioning of any organ.
5. Acquired diseases are the diseases that an individual develops after birth, during their life span. Such diseases are related to pathogen infections, ageing or climatic changes. They may be infectious or non-infectious. Examples: malaria, cancer, tuberculosis, AIDS.
6. **Acute disease** is a type of disease which occurs for a short interval of time. Acute diseases appear suddenly and remain for a short duration, but their symptoms are severe and require immediate attention or care. Examples: common cold, typhoid, jaundice.
7. **Chronic diseases** are diseases which occurs for a long-term duration, with the symptoms lasting for few months or years too. These diseases develop slowly but may progress over time in our body. It may last for a lifetime and sometimes even become fatal. Examples: diabetes, arthritis, heart, and kidney diseases.
8. The diseases that are spread or transmitted from one person to another through various mediums are called infectious or **communicable diseases**. They are usually caused by microorganisms called pathogens. Examples: cholera, chickenpox.
9. The diseases that are not spread or transmitted from one person to another are called **non-infectious** or **non-communicable diseases**. Examples: Alzheimer's, asthma, cataract.
10. **Degenerative diseases** are caused due to ageing. Degenerative diseases are the result of a continuous process based on degenerative cell changes, affecting tissues or organs, which increasingly deteriorate over time.
11. An allergic reaction arises when the body becomes hypersensitive to certain foreign substances called **allergens**. This allergic reaction leads to a disease in which the immune system makes an inflammatory response to allergens.
12. **Deficiency diseases** are caused due to the deficiency of essential nutrients or dietary elements in the human body such as hormones, minerals, nutrients, and vitamins.

DESCRIPTIVE QUESTIONS

I. VERY SHORT ANSWER QUESTIONS

1. What is a disease?
2. How does a disease affect the functioning of the body?
3. Name the two types of acquired diseases.
4. Name any two acute diseases.
5. Name any two chronic diseases.
6. What are infectious diseases?
7. What are antihistamines?
8. State the causes of degenerative diseases.
9. What are allergens?

10. Is Alzheimer's disease, an example of a degenerative disease? Explain.

II. SHORT ANSWER QUESTIONS

11. Name the different types of diseases based on their presence at the time of birth.
12. Differentiate between acute and chronic diseases.
13. What are the basic differences between communicable and non-communicable diseases?
14. Are allergic reactions harmful? Explain.
15. What factors contribute to the development of congenital diseases in an individual?

III. LONG ANSWER QUESTIONS

16. Give an account of classification of diseases based on at least two different criteria.

IV. FILL IN THE BLANKS

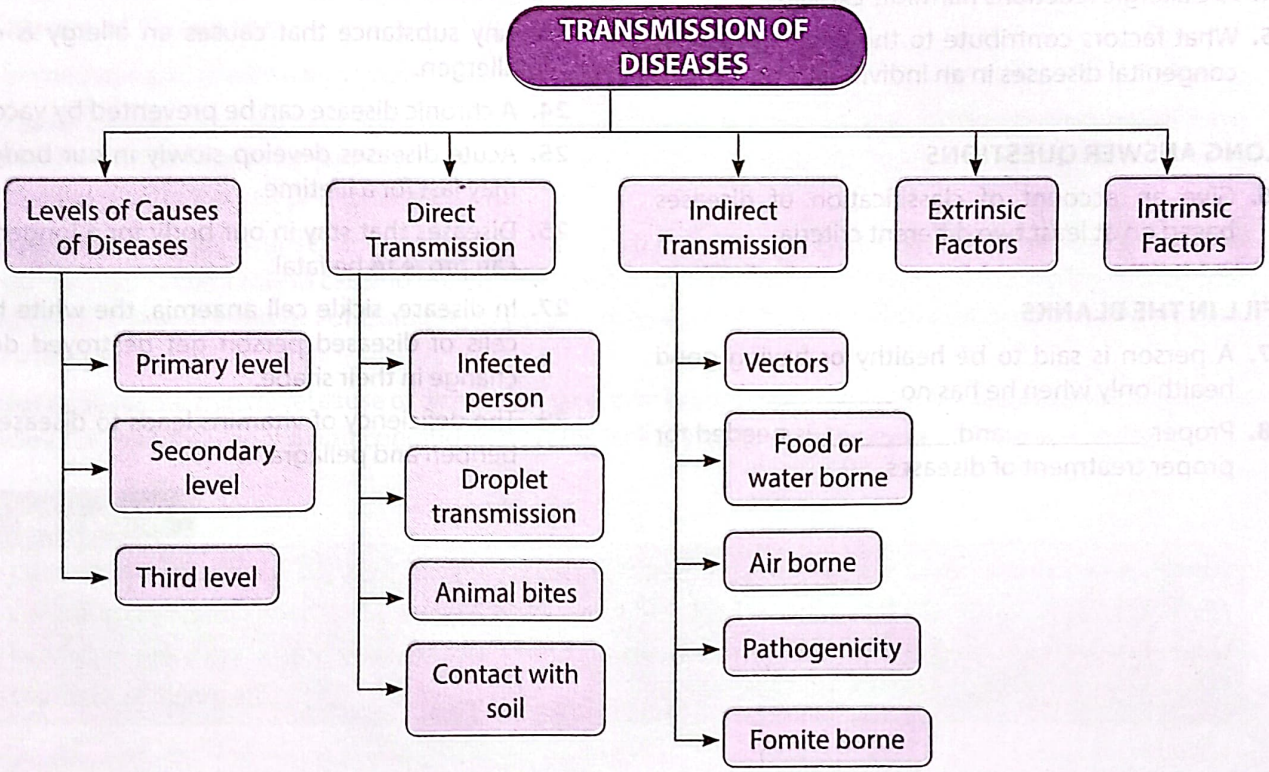
17. A person is said to be healthy or having good health only when he has no _____.
18. Proper _____ and _____ is needed for proper treatment of diseases.
19. The diseases are usually caused by microorganisms called _____.
20. _____ diseases refer to the medical condition that occurs suddenly and lasts for a short time.
21. Diseases such as _____show characteristics of degenerative diseases in the form of increased bone weakness.
22. Asthma is one of the best examples of _____ reaction.

V. TRUE OR FALSE

23. Any substance that causes an allergy is called allergen.
24. A chronic disease can be prevented by vaccines.
25. Acute diseases develop slowly in our body and may last for a lifetime.
26. Diseases that stay in our body for a longer time can prove to be fatal.
27. In disease, sickle cell anaemia, the white blood cells of diseased person get destroyed due to change in their shape.
28. The deficiency of vitamins leads to diseases like beriberi and pellagra.

4.03 Transmission of Diseases and Their Prevention

MIND MAP



INTRODUCTION

In the previous topic, we learnt various types of diseases based on different criteria and some of their causes. Primarily, understanding the cause of disease is the key to begin the process of finding remedies that could cure it. Also, the susceptibility of a diseases varies from individual to individual, indicating that the causes underlying the disease may vary from person to person. Scientists and physicians have spent a long time searching for the various causes of disease.

Exposure to a causative agent is not solely responsible for the development of a disease. For example, a room full of people may be exposed to a person suffering from common cold, but only one or two may later develop a cold. This indicates that many other host factors also determine whether the agent will induce disease or not. Thus, in the pathogenesis of disease, the resistance, immunity, age, and nutritional state of the person exposed, as well as virulence or toxicity of the agent and the level of exposure, all play a role in determining whether disease develops.

CAUSES OF DISEASES

The causes of a disease can be discussed under various headings:

Immediate and Contributory Cause

Based on the direct and indirect involvement of a factor in causing a disease, they may be:

(i) **Immediate Causes:** The factors directly responsible for the development of disease are referred to as immediate causes. It may be a pathogen (disease causing microorganisms) or genetic abnormality or other factors. For example, the organisms such as virus, bacteria, protozoa, that enter our body and cause the disease are termed as immediate causes. These causes can be infectious as well as non-infectious.

(ii) **Contributory Causes:** The factors that are not directly responsible for the development of diseases but contributes to the manifestation of disease are called contributory causes. These are also called secondary factors. For example, dirty water, contaminated food, polluted air, unhealthy lifestyle, improper nourishment, poor standard of living, etc. These factors are not the direct causes but contribute to causing a disease.

Levels of Causes of Diseases

Based on the immediate and contributory causes, there are three levels for the causes of diseases:

(i) **Primary level causes:** This primary level cause of disease is related to immediate factor causing the disease. Since this refers to the agent or pathogen which actually causes the disease, these causes are referred to as immediate cause or primary or precipitating cause.

(ii) **Secondary level causes:** The secondary level cause of disease may be due to the contributing factors that though do not play a direct role in causing the disease but are responsible for increased susceptibility of a disease when exposed to primary cause. For example, improper nourishment (lack of nutritional diet), weak immunity, unhealthy lifestyle.

(iii) **Third level causes:** The third level cause of disease are factors or causes responsible for the secondary and primary level causes. For example, poor living conditions, poverty, lack of public services makes the person unhealthy.

Key point

Contributory causes: The secondary or third level causes are also called as contributory causes. These contributory causes refer to the secondary factors which lead to entry of these organisms in our body. Examples are dirty water, contaminated food, unclean surroundings, improper nourishment, poor standard of living, etc.

External or Extrinsic Causes

Extrinsic factors refer to external agents or factors that may enter the human body from outside and affect the normal functioning of human body, causing the diseases.

Types of External Causes

Some of the external factors causing the disease are:

(i) **Pathogens:** The disease-causing pathogens are viruses, bacteria, fungi, protozoans, helminths, worms, etc. These pathogens may enter the human body through air, contaminated water, food, by physical or sexual act or by animals and cause diseases. Such diseases are mostly infectious.

(ii) **Inadequate diet:** If a person's diet lacks all essential nutrients and in right proportion, the person may be unhealthy and prone to diseases. A person taking improper diet may show the deficiency diseases such as night blindness, beriberi, scurvy, rickets, osteomalacia, marasmus, kwashiorkor etc.

BeriBeri Disease

Rickets

(iii) **Environmental pollutants:** The different kinds of environmental pollutants such as oxides of carbon, oxides of nitrogen and oxides of sulphur, particulate matter, industrial chemicals, heavy metals (mercury, lead, cadmium, arsenic), pesticides etc., are all causes of diseases. Such diseases are mostly non-infectious.

(iv) **Substance abuse:** Prolonged continuous use of substances such as tobacco, alcohol and narcotic drugs results in harmful effects, leading to chronic diseases.

Internal or Intrinsic Causes

Intrinsic factors are the factors that exist within the human body and cause diseases. Such diseases are mostly non-infectious.

Types of Internal Causes

Internal causes of diseases are:

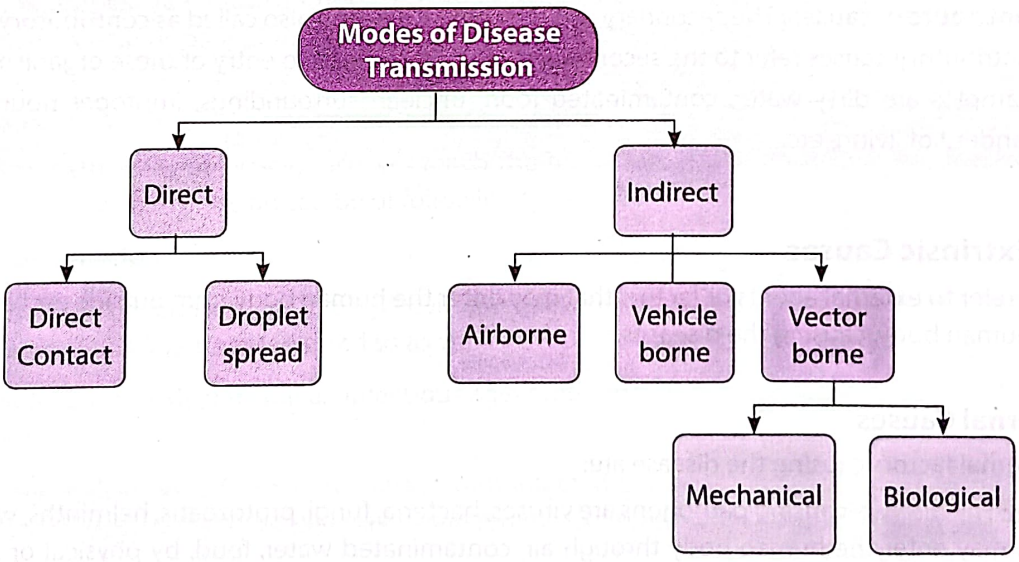
(i) Genetic disorders
(ii) Hormonal imbalance
(iii) Allergic reaction
(iv) Weak immune system
(v) Malfunctioning of vital body organs and immune cells

TRANSMISSION OF COMMUNICABLE DISEASES

Infectious or communicable diseases spread from one infected person to healthy person(s). This occurs due to the spread or transfer of pathogens from the infected person either by air, water, vectors, exchange of body fluids, or by sexual contact.

Modes of Transmission

Depending on the mode of transmission, it is classified into two types:



Direct Transmission

- Direct transmission refers to the immediate transfer of the infectious agent or pathogen from infected person or reservoir to an appropriate entry point through which another human can get infected.

- Direct transmission takes place by direct contact such as touching, kissing, sexual contact, or by the direct spread of droplets through sneezing or coughing.
- Some important examples of direct transmission of infectious diseases are **blood transfusions** and **transplacental infection** from mother to foetus.

Modes of Direct Transmission

(a) **Direct Contact:** Direct contact occurs through physical skin-to-skin contact, kissing, and sexual intercourse. Direct contact also refers to contact with soil or vegetation harboring infectious organisms. Thus, the infectious diseases are spread from person to person by direct contact.

(i) **Physical contact with infected person:** The pathogens of diseases like chicken pox, ring worm are spread through direct physical contact with infected person or even by using the articles used by them. Therefore, such diseases are called contagious diseases.

(ii) **Sexual contact:** Few infectious diseases such as syphilis, gonorrhoea (both caused by bacteria) and AIDS (caused by virus) are transmitted by sexual contact between individuals. These diseases, however, do not spread by casual physical contact like handshake, hug or sports like wrestling or some other ways in which we touch each other socially but by exchange of bodily fluids like semen, saliva, and blood. AIDS, therefore, can also spread through blood transfusion from infected person, use of common needles and syringes or from mother to child during pregnancy or through breast feeding.

(iii) **Contact with Soil:** Many pathogens can enter the human body from soil through open injuries e.g., tetanus. Hookworm also spreads by direct contact with contaminated soil.

(iv) **Transplacental transmission:** Besides sexual contact, some diseases like AIDS, German measles and syphilis are also transmitted from infected mother to the foetus through placenta.

(b) **Droplet Spread:** Droplet spread refers to release of relatively large, short-range aerosols produced by sneezing, coughing, or even talking. Droplet spread is classified as direct because transmission is by direct spray over a few feet before the droplets fall to the ground. Pertussis and meningococcal infection are examples of diseases transmitted from an infectious patient to a susceptible host by droplet spread.

Indirect transmission

In indirect transmission, pathogens of certain diseases reach the human body through some intermediate agents. Based on these agents, indirect transmission can be of following types:

(i) Vehicle Borne Transmission

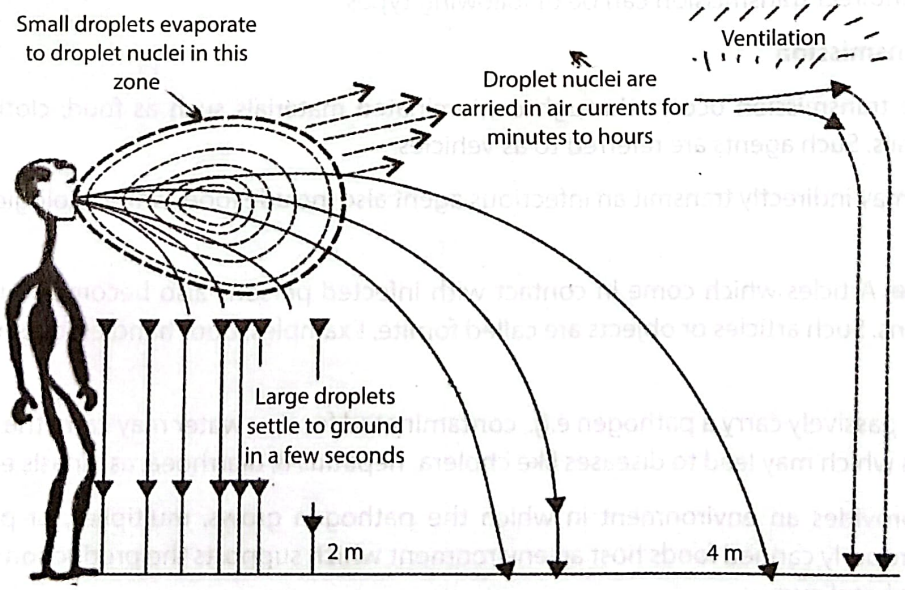
- Vehicle-borne transmission occurs through contaminated materials such as food, clothes, bedding, and cooking utensils. Such agents are referred to as vehicles.
- Vehicles that may indirectly transmit an infectious agent also include food, water, biologic products (blood), and fomites.
- **Fomite borne:** Articles which come in contact with infected persons also become source of infection to healthy persons. Such articles or objects are called fomite. Examples: door handles, taps, utensils, garments, currency, etc.
- A vehicle may passively carry a pathogen e.g., contaminated food or water may carry the hepatitis B virus or other bacteria which may lead to diseases like cholera, hepatitis B, diarrhoea, ascariasis etc.
- The vehicle provides an environment in which the pathogen grows, multiplies, or produces toxin. For example, improperly canned foods host an environment which supports the production of botulinum toxin by *Clostridium botulinum*.

(ii) Vector Borne Transmission

- Vector-borne transmission occurs when the intermediate agent is an insect or animal (the vector). This vector transfers the infectious pathogen to a susceptible host. The pathogen may or may not multiply in the vector.
- Vectors such as mosquitoes, fleas, and ticks may transmit the infectious agent either through mechanical means or through biological means by supporting growth or changes in the life cycle of pathogen.
- During **mechanical transmission**, vectors like houseflies transfer the pathogen without taking the infectious agents inside their bodies. They are called carriers. For example, housefly is a carrier of cholera, dysentery, typhoid, diarrhoea, etc.
- During **biological transmission**, *Plasmodium*, the causative agent of malaria disease undergoes maturation in an intermediate host (mosquito) before it is transmitted to humans or the virus that is transmitted through mosquito e.g., dengue, chikungunya.

(iii) Air Borne Transmission

- Air borne transmission occurs when infectious agents carried by dust or droplet nuclei remain suspended in the air.
- Long-distance airborne transmission occurs when tiny infectious droplets from the respiratory tract of an infected person are released (by sneezing, coughing, or spitting) and spread through air and reaches the respiratory tract of a healthy person, thus transmitting the infectious agent.
- Air borne transmission of diseases is more rapid in crowded areas.
- Dust particles also facilitate airborne transmission. For example, fungal spores are spread through air.
- Airborne dust particles include material that has settled on surfaces and become re-suspended by air currents as well as infectious particles blown from the soil by the wind.
- Droplet nuclei are dried residue of fewer than 5 microns in size. In contrast to droplets that fall to the ground within a few feet, droplet nuclei may remain suspended in the air for long periods of time and maybe blown over great distances. For example, measles is transmitted to children, since the measles virus remained suspended in the air.



Key points

- **Pathogenicity** refers to the ability of an organism to cause disease, thus causing harm to host. The ability to cause disease is due to the genetic component of pathogen while the damage or harm done to the host is a result of host-pathogen interactions.
- **Virulence** refers to the degree of pathology caused by the organism. This term is used interchangeably with pathogenicity. The extent of the virulence is usually correlated with the ability of the pathogen to multiply within the host and may be affected by other factors.
- Pathogens can express a wide range of virulence.

MISCONCEPTION

Fomite is a living object or substance capable of carrying disease causing organisms and hence, transferring them from one individual to another.

FACT: Fomite refers to non-living objects or substances capable of carrying disease causing organisms and hence, transferring them from one individual to another. Fomite could be anything, for example, clothing, utensils, bedding items, surgical instruments, and others.

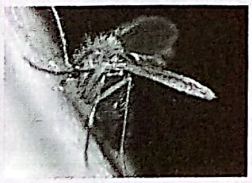
ACTIVITY

Aim: To identify the type of disease being transmitted by various insects or vectors

Method: From the given images of insects, identify the vector, the disease transmitted by it and the mode of transmission in humans.

Illustration:

Insect Vector	Disease Transmitted and Mode of Transmission
1. Female *Anopheles* mosquito 	
2. *Culex* mosquito 	
3. *Aedes* mosquito 	

4. House fly 	
5. Lousea 	
6. Rat fly 	
7. Tse-Tse fly 	
8. Sandfly 	

Observation:

Insect Vector	Disease Transmitted
1. Female Anopheles Mosquito 	Malaria
2. Culex Mosquito 	Filariasis

3. Aedes Mosquito 	Yellow fever (Jaundice), Dengue
4. House fly 	Typhoid, Diahorrea, Dysentry, Cholera
5. Lousea 	Epidemic Typhus
6. Rat fly 	Plague
7. Tse-Tse fly 	Sleeping Sickness
8. Sandfly 	Kala-azar

DEVELOP

Once the disease-causing pathogens enter the human body through various means, the diseases manifest itself in human body. These manifestations may be localized or systemic. As we know, human body is made up of several tissues, organs, and organ systems. When a microbe enter the human body, it may affect any specific tissue or organ and gets multiplied there itself. Such effects refer to tissue-specific manifestations or organ specific manifestations.

Organ Specific Manifestations

Organ specific manifestations are those which affect a person's organs. When microbes enter the human body and travel to a specific organ and multiply there, such as lungs or kidneys, they affect their functioning. For example, *Mycobacterium tuberculosis* is the bacteria that causes tuberculosis. These bacteria enter the body through the nose and migrates to the lungs, affecting them. Another disease-causing bacterium is *Salmonella*. This bacteria enter through the mouth through consumption of infected food or water and travels to the gut lining, thus, affecting the digestive system.

Tissue-Specific Manifestations

Tissue specific manifestations occur when microbes affect specific tissues, multiply there and affect a person's normal body functioning. The severity of disease or infection \ depends upon the quantity of pathogens infecting the body. The immune system also gets activated in response to the infections. When the immune system is damaged due to the invasion of a deadly virus like HIV, the body can no longer fight the infections and the patient does not survive for long.

Principles of Treatment

There are two methods or ways to treat an infectious (communicable) disease:

(i) **Reduce the effects of disease:** The effects of disease can be reduced by providing symptomatic treatment. This treatment is provided to reduce the symptoms. The treatment of taking medicines or taking bed rest is for conserving energy. But these simple techniques sometimes may not be sufficient to remove the disease-causing microbes from the body. To cure the disease, we need to kill the microbes.

(ii) **Kill the cause of the disease:** The second method or a technique of treatment is to kill the disease-causing agents using medicines. The pathogens or disease causing microbes belong to different groups such as viruses, bacteria, fungi, and protozoans. Each of these groups of microbes have some essential biochemical life processes which are peculiar to that group. Similarly, our cells also have different pathways or mechanisms than the ones used by these groups of pathogens. Therefore, certain drugs that blocks their biochemical pathway without affecting our own functioning are used to kill these pathogens. For example, antibiotics which block the bacterial protein synthesis pathway.

Principles of Prevention

The treatment of an infected person suffering from a disease poses certain limitations:

(i) The body of a person suffering from a disease may get impaired and sometimes he may not even recover completely.

(ii) Sometimes even after giving proper treatment, the person may get bedridden for a certain period.

(iii) The infected person serves as a potential source of spread of the infectious disease to others in the community.

Keeping in view these limitations, prevention of diseases is considered far better than their cure. The preventive measures are precautionary steps taken to check the transmission of infectious diseases.

- Breaking the chain at the 'mode of transmission' is one of the most important ways to interrupt the spread of infection. This is the point where the prevention of infection and its control strategies can be most successful.
- It is also important to distinguish between the types of transmission while selecting the control methods.
- Direct transmission can be interrupted by preventing contact with the source whereas the indirect transmission requires different approaches, such as the provision of mosquito nets, adequate ventilation, cold storage for foods or sterile syringes and needles.

Measures to Prevent Infectious Diseases

There are two major ways of prevention of infectious diseases:

(i) **General ways of prevention of infectious diseases:** The general ways of preventing infections are mostly related to preventing exposure to the pathogens or infectious agents.

(a) **Public hygiene:** Public hygiene is one of the basic key to the prevention of infectious diseases. Garbage heaps, polluted water, foods exposed to dust and flies are reservoir for some of the chief disease-causing organisms. Clean surroundings can prevent spread of infectious diseases. For air-borne diseases, we can prevent exposure by providing living conditions that are not overcrowded. Clean drinking water can be provided to prevent exposure to water-borne microbes. This can be done by treating the water with disinfectants before its distribution.

(b) **Eradication of vectors:** The breeding places of vectors such as mosquitoes should be destroyed, and adult vectors can be killed by spraying insecticides and providing clean environment.

(c) **Sterilization:** Patient's surroundings and articles of use should be sterilized with soap, phenyl, sanitizers, etc. Antiseptic lotion may be used wherever necessary.

(d) **Isolation:** A person suffering from an infectious disease should be kept in isolation, so that others don't get infected.

(e) **Education:** People should be aware and educated about the spread and transmission of infectious diseases so that they may take proper measures to protect themselves against such diseases.

(f) **Proper and sufficient food:** Availability of proper (nutritious) and sufficient food is also essential to keep people healthy enough to resist infections. It helps them to develop a strong immune system so that the infectious agents cannot cause a major harm to the body.

(ii) **Specific ways of prevention of infectious diseases:** Specific ways of prevention of infectious diseases can be related to the peculiar property of the immune system, that usually fights off microbial infections. Let us try to understand this property by taking the example of smallpox disease.

Now a days, smallpox disease has been eradicated from the world. However, a few years ago, smallpox was very common. In such an epidemic, people were scared to take care of the patient, suffering from smallpox since they were afraid of contracting the disease. However, there was also a group of people who wasn't afraid to get smallpox and they used to provide nursing to the smallpox patients. These group of people are ones who had smallpox earlier but survived it with lot of scars. In simple words, one who had smallpox once, was not likely to get affected by it again. This is because the body's immune system responds against the infectious microbe when it invades the body for the first time. Once a response is generated (antibodies and other fighting cells) by immune system, it is remembered and stored in memory of immune system specifically. When the same pathogen or microbe invades the same person next time, the immune system immediately responds with greater vigour, and eliminates the pathogen more quickly than the first time. This is how the immune system works in our body. This same principle forms the basis of the process of immunization, one of the specific ways to prevent infectious diseases.

Immunization

Traditional Indian and Chinese medicinal systems sometimes deliberately rubbed the thin crusts from smallpox victims into the skin of healthy people. They did this to induce a mild form of smallpox that would create resistance against the disease.

Famously, two centuries ago, an English physician named Edward Jenner, realized that milkmaids who had cowpox did not catch smallpox, even during the epidemic. Cowpox is a very mild disease. Jenner tried to deliberately give cowpox to people and found that they were now resistant to smallpox as well. This was because the smallpox virus is closely related to the cowpox virus. Cow is referred to as "vacca" in Latin, and cowpox as "vaccinia". From these two terms, the word "vaccination" has come into existence.

Immunization helps in preventing diseases by producing a specific response to the disease for which the non-infectious pathogen or pathogen like substance has been introduced in the body. Though by this immunization, the person do not get the actual disease but gets prepared for the actual disease or pathogen attack by remembering the immune response.

Vaccines

Antibody provoking agents are termed vaccines. The term "vaccine" is used for a preparation of antigenic proteins or pathogens or weakened or dead pathogens which on inoculation into a healthy person provides temporary/ permanent immunity against the diseases by inducing antibodies formation. Vaccines reduce the risks of getting a disease by working with your body's natural defenses to build protection. Now, vaccines are available for preventing the whole range of infectious diseases e.g., tetanus, diphtheria, whooping cough, measles, polio, hepatitis-B, cholera, tuberculosis, measles, mumps, etc. These form the public health programs of childhood immunization for preventing infectious diseases.

Vaccination is a technique to develop immunity in individuals without infection. In vaccination, a preparation of antigenic protein of pathogens or weakened or dead pathogens are injected into a person, required to be immune against a certain disease. The pathogens, given in a vaccine, are unable to cause a disease but are sufficient to generate the primary immune response.

Important vaccines for babies and children

S. No	Vaccine	Disease	Safety (Efficacy)
1.	BCG	Tuberculosis (TB)	50-80%
2.	Polio	Poliomyelitis	90-95%
3.	DPT	Diphtheria, pertussis (Whooping cough), Tetanus	70-90%
4.	Hepatitis B	Hepatitis	>95%
5.	Hib	Haemophilus influenzae type B	90-95%
6.	Measles	Measles	95%

MISCONCEPTION

A vaccine contains a powerful form of infectious agents or pathogen like viruses or bacteria to induce an immune response or antibodies.

FACT: A vaccine contains only killed or weakened forms of germs like viruses or bacteria. They are not pathogenic enough to cause actual disease. Vaccination is a safe and effective way to prevent disease and save lives.

DEVELOP

Prevention and Control of Some Diseases

Disease	Causative Organism	Mode of Transmission	Control	Prevention
Malaria	*Plasmodium*	Bite of female *Anopheles* mosquito	Quinine	Breaking contact between female *Anopheles* and man, eliminating *Anopheles* mosquito

Diarrhoea	Protozoan, bacteria, viruses	Contaminated food and water	ORS or salt- sugar solution	Proper sanitation, personal hygiene
Cholera	*Vibrio cholerae*	Contaminated food and water	Antibiotics, ORS or salt-sugar solution	Proper sanitation, vaccination
Typhoid	*Salmonella typhi*	Contaminated food and water	Use of antibiotics	Proper sewage system, using chlorinated or boiled water
Tuberculosis	*Mycobacterium tuberculosis*	Cough/sneeze droplets, contaminated milk	Use of antibiotics	Awareness to maintain cleanliness in public places and BCG vaccine for children
Hepatitis	Hepatitis viruses (A-G)	Contaminated food and water for some forms, through body fluids for others	Rest, antiviral injection, food rich in carbohydrates	Good sanitation, safe drinking water, use tested blood, disposables needles and syringes
Rabies	Rabies virus	Bite of infected animal	No cure after the disease develops	Wash the wound antirabies serum, course of vaccine shots, pets should be vaccinated
AIDS	Human immunodeficiency virus (HIV)	Infected blood, semen, breast milk, mother to foetus	No cure yet, a combination of drugs slows down progress of the diseases	Screening of blood and donors, use of disposable needles and syringes, not sharing blades and razors, safe sex practices
Influenza	Myxovirus	Cough/sneeze droplets	No cure, bed rest, aspirin and fluids provide relief	Keeping away from infected person

DEVELOP

Antibiotic Resistance

It is one of the big threats to global health, food security.

- Antibiotics are the medicines used to prevent and treat bacterial infections.
- Antibiotic resistance occurs when bacteria change its response to the use of these medicines. In this situation the bacteria become antibiotic resistant, not humans or animals that take the antibiotics.
- Now these resistant bacteria may infect humans and animals, and the infections caused by them are harder to treat as compared to those caused by non-resistant.bacteria.
- Antibiotic resistance leads to higher medical costs, prolonged hospital stays, and increased mortality.
- Hence, the remedy is to prevent and control the spread of antibiotic resistance. The individuals should use antibiotics only when prescribed by a certified health professional.
- Antibiotics are not taken during cold. It is so because cold is caused due to viral infection and antibiotics do not work against viruses.
- In bacterial infections, administration of antibiotics to the patient is must. When bacterial infection occurs during a viral disease, then patients who take antibiotics cure early than those who do not take antibiotics.

ACTIVITY

Aim: To identify the various common infectious diseases caused by different pathogens

Illustration:

Infectious Diseases	Pathogen
Common cold, influenza, AIDS, dengue fever	
Typhoid, Cholera	
Kala-azar	
Acne	
Sleeping sickness	
Elephantiasis	

Result:

Infectious Diseases	Pathogen
Common cold, influenza, AIDS, dengue fever	Viruses
Typhoid, Cholera	Bacteria
Kala-azar	*Leishmania* (Protozoa)
Acne	*Staphylococci* (Bacteria)
Sleeping sickness	*Trypanosoma* (Protozoa)
Elephantiasis	Worms

EXAMPLES

1. List any three reasons why you would think that you are sick and ought to see a doctor. If only one of these symptoms were present, would you still go to a doctor? Give reason for your answer.

Solution: One may feel sick and to go to see a doctor when following symptoms are experienced:

(i) Have fever **(ii)** Have diarrhoea (loose motions) **(iii)** Have severe cough/cold

Even if only one of these symptoms is present, it is still advisable to go to a doctor because he will diagnose and treat the disease based on symptoms. Doctor will also run some laboratory tests to further confirm the disease.

2. In which of the following cases, do you think the long-term effects on your health are likely to be the most unpleasant?

(i) Jaundice **(ii)** Infection with lice **(iii)** Prone to acne

Solution: In case of disease jaundice, there would be long-term effects on the body. It is so because in disease jaundice, the liver gets affected. Symptoms of jaundice include abdominal pain, fever, vomiting, pale stools, fatigue, weight etc., therefore it takes more time to recover from this disease. On the other hand, lice can be removed easily with short treatment and so is the acne. Both the two conditions of lice and acne do not produce long-term effects on the body.

3. What precautions can be taken in a school to reduce the incidence of infectious diseases?

Solution: Following precautions can be taken in the schools to reduce the incidence of infectious diseases:

(i) Provide clean drinking water

(ii) Educate students about causes and transmission of infectious diseases

(iii) Create awareness about personal and community hygiene and follow those practices

(iv) Proper sanitation or clean environment in school and its surroundings to eradicate vectors of infectious diseases

(v) Vaccination of students against common infectious diseases from time to time

(vi) By not allowing the affected students to attend the classes till they recover from infectious diseases

4. What are the immunization programs available at the nearest health centre in your locality? Which of these diseases pose major health problems in your area?

Solution: Immunization programs available at a health centre are:

(i) BCG vaccination against tuberculosis

(ii) Polio drops against polio disease

(iii) Vaccination against chicken pox

(iv) Vaccination against Hepatitis

(v) DPT vaccination against diphtheria, pertussis (whooping cough) and tetanus

(vi) Immunization against measles

Major health problems of concern in a locality are:

(i) Hepatitis **(ii)** Chicken pox

(iii) Tuberculosis **(iv)** Polio

5. State the possible causes for the occurrence of non-infectious diseases.

Solution: Non-infectious diseases may occur due to following reasons:

(i) Malfunctioning of some important body organs e.g., heart diseases, epilepsy etc.

(ii) Inadequate diet or deficiency of nutrients, minerals, and vitamins e.g., kwashiorkor, marasmus, beriberi, scurvy, night blindness, etc.

(iii) Hypo or hyper–secretion of hormones e.g., diabetes, iodine-deficiency goitre, cretinism, myxodema, etc.

(iv) Malfunctioning of immune system e.g., autoimmune diseases, allergy.

ACTIVITY

Aim: Find out the plan of your local authority for the control of rabies in your neighbourhood. Are these measures adequate? If not, what improvements would you suggest?

Observation and Conclusion: For the control of rabies, stray dogs are being vaccinated and sterilized in the neighbourhood, by the local authorities. Rabies virus is spread by the bite of infected dogs and other animals. There are anti-rabies vaccines for both humans and animals.

These measures are adequate on the part of local authorities.

RECALL

1. A **disease** is a discomfort, or some uneasiness felt by an individual caused by a disturbance in normal functioning of the body.
2. The factors directly responsible for the development of disease are referred to as immediate causes. For example, it may be a pathogen (disease causing microorganism such as bacteria, virus, fungi etc.,) or genetic abnormality or other factors.
3. The factors that are not directly responsible for the development of diseases but contributes to the manifestation of disease are called contributory causes. For example, dirty water, contaminated food, polluted air, unhealthy lifestyle, improper nourishment, poor standard of living, etc.
4. Extrinsic factors are external agents or factors that may enter the human body from outside and affect the normal functioning of human body, causing the diseases. Some of the external factors are pathogens, inadequate diet, environmental pollutants, substance abuse.
5. Intrinsic factors are the factors that exist within the human body and cause diseases. These may be genetic disorders, hormonal imbalance, allergic reaction, malfunctioning of immune system. Such diseases are mostly non-infectious.
6. Direct transmission refers to the immediate transfer of the infectious agent or pathogen from infected person or reservoir to an appropriate entry point through which another human can get infected. It may take place either by direct contact such as touching, kissing, sexual contact, or by the direct spread of droplets through sneezing or coughing.
7. In indirect transmission, pathogens of certain diseases reach the human body through some intermediate agents. Based on these agents, indirect transmission can be vehicle borne, vector borne or air borne.
8. Vehicle-borne transmission occurs through contaminated materials such as food, clothes, bedding, and cooking utensils. Such agents are referred to as vehicles. A vehicle may passively carry a pathogen e.g., contaminated food or water may carry the hepatitis B virus or other bacteria which may lead to diseases like cholera, hepatitis B, diarrhoea, ascariasis etc.
9. Vector-borne transmission occurs when the intermediate agent is an insect or animal (the vector). This vector transfers the infectious pathogen to a susceptible host. Vectors such as mosquitoes, fleas, and ticks may transmit the infectious agent either through mechanical means or through biological means by supporting growth or changes in the life cycle of pathogen.
10. Air borne transmission occurs when infectious agents carried by dust or droplet nuclei remain suspended in the air. Long-distance airborne transmission occurs when tiny infectious droplets from the respiratory tract of an infected person are released (by sneezing, coughing, or spitting) and spread through air and reaches the respiratory tract of a healthy person, thus transmitting the infectious agent.
11. The two ways to treat an infectious disease is to either reduce the effect of disease or kill the cause of disease (pathogen).
12. The most important strategy to prevent a disease is to break the chain at mode of transmission. Direct transmission can be interrupted by preventing contact with the source whereas the indirect transmission requires different approaches, such as the provision of mosquito nets, adequate ventilation, cold storage for foods or sterile syringes and needles.
13. The general ways of preventing infectious diseases include public hygiene, eradication of vectors, sterilization of fomites, isolation of infected persons, providing nutritious diet, and creating awareness about the spread and transmission of infectious diseases.
14. The specific ways of preventing infectious diseases include immunization and vaccination against certain diseases.

DESCRIPTIVE QUESTIONS

I. VERY SHORT ANSWER QUESTIONS

1. State any three causes of diseases.
2. Based on different factors, name the different categorization of causes of diseases.
3. What do you understand by immediate cause of diseases?
4. What is meant by contributory causes of diseases?
5. Define aetiology.
6. What is a vaccine?
7. Name two diseases for which vaccine is available.
8. State one major difference between the causes of infectious and non-infectious diseases.
9. Name any four disease causing microorganisms (pathogens).
10. State any one mode of transmission or entry of these infectious pathogens in the human body.
11. Name any four deficiency diseases in human beings.
12. Name any two environmental gaseous pollutants that cause diseases.
13. What happens to a disease-causing organism or agent once it enters our body?

II. SHORT ANSWER QUESTIONS

14. Give reason why antibiotics are not effective against viral infections.
15. Differentiate between immediate and contributory cause of diseases.
16. Categorize the given diseases as infectious and non-infectious diseases.

    (i) Tuberculosis **(ii)** Cancer

    (iii) Tetanus **(iv)** Common cold

    (v) High blood pressure **(vi)** AIDS
17. Why is vaccination considered an important technique?
18. List the names of vaccines available for immunization against diseases in children. Also mention the disease against which it is given.
19. Briefly describe some of the modes of direct transmission of infectious diseases.

III. LONG ANSWER QUESTIONS

20. Describe the various levels, the external and the internal factors responsible for the causes of diseases.
21. Give an account of modes of indirect transmission of infectious diseases.

IV. FILL IN THE BLANKS

22. Continuous use of tobacco, alcohol and narcotic drugs results in harmful effects leading to _____ diseases.
23. The cause of disease due to lack of nutritional diet is a _____ cause.
24. Pathogens causing the disease are referred to as _____ causes.
25. The diseases which spread due to infection by micro-organisms are called _____ diseases.
26. _____ is a carrier of cholera, dysentery, typhoid, diarrhoea, etc.

V. TRUE OR FALSE

27. Pneumonia is a non-infectious disease spread through air.
28. Amoebic dysentery is an infectious disease spread through water.
29. Diarrhoea is an infectious disease spread through vectors.
30. Diseases are not caused due to poor public health services.

4 | Why Do We Fall Ill?

PRACTICE SHEET

SINGLE CORRECT QUESTIONS

1. Which of the following figure illustrates the practice of personal hygiene?

(A) 

Hand hygiene

(B) 

Hospital set up

(C) 

Wash and health care facilities

(D) 

Sanitation and hygiene

2. The hygiene of ears can be maintained by:

(A) Avoiding injury to the eardrums

(B) Preventing spread of germs

(C) Removal of accumulated wax which can lead to infections

(D) Cleaning of ears to avoid dandruff and parasites

3. Which of the following practices need to be adopted for maintaining hygiene?

(i) Keeping oneself clean

(ii) Keeping the surroundings clean

(iii) Use of clean drinking water to prevent illness or spread of diseases

(A) (i) and (ii) only

(B) (ii) and (iii) only

(C) (iii) and (i) only

(D) (i), (ii), and (iii) only

4. Akhil take special care that his clothes and undergarments are clean and dry. This practice will help him:

(A) To protect from injuries

(B) To be free from dandruff

(C) To control fungus development

(D) To prevent skin infection and rashes

5. A person is usually advised to have regular physical exercise and adequate sleep. How does it help us to maintain health?

(A) To stay physically active and mentally alert

(B) To synthesize saturated fats in the body

(C) To increase the body temperature

(D) To lose the appetite

6. Diarrhoea is caused in children due to
(A) Fungal infection (B) Viral infection (C) Bacterial infection (D) Vitamin C deficiency

7. Which disease is caused due to uncontrolled cell division?
(A) AIDS (B) Elephantiasis (C) Cancer (D) Gigantism

8. Identify the types of pathogens causing diseases in humans.
(A) Bacteria, fungi, and viruses (B) Cow pox, chicken pox and mumps
(C) Cholesterol and saturated fats (D) All of these

9. The deficiency disease kwashiorkor is caused due to deficiency of which nutrient?
(A) Fat (B) Carbohydrates (C) Protein (D) Vitamin

10. Common cold can be transmitted from
(A) A healthy person (B) A handshake (C) Temperature drop (D) None of the above

11. The female *Anopheles* mosquito is a carrier of the pathogen that causes disease:
(A) Cholera (B) Malaria (C) Filariasis (D) Yellow fever

12. The female *Culex* mosquito is responsible for transmission of disease:
(A) Dengue (B) Filariasis (C) Typhoid (D) Bubonic plague

13. An example of water borne disease is:
(A) Malaria (B) Tuberculosis (C) Cholera (D) Dengue

14. The disease dengue is caused due to:
(A) Protozoa (B) Bacteria (C) Virus (D) Fungi

15. The symptoms of a disease are more severe, if
(A) The invading microbes are more in number (B) The target organ gets affected
(C) Both (A) and (B) (D) None of the above

SINGLE CORRECT QUESTIONS

16. The causative agent of typhoid fever in human beings is:
(A) Rhinoviruses (B) *Trichophyton* (C) *Plasmodium vivax* (D) *Salmonella typhii*

17. Pick out the false statement from the following.
(A) Pathogens causing pneumonia are *Streptococcus pneumoniae* and *Haemophilus influenzae*
(B) Pneumonia can be transmitted by droplets released by an infected person as well as by sharing utensils.
(C) There is still no vaccine available, to prevent pneumonia.
(D) All the above

18. The bacterial disease in humans is:
(A) Malaria (B) Pneumonia (C) Plague (D) Both (B) and (C)

19. Whooping cough is caused by:
(A) *Brucella melitensis* (B) *Vibrio cholerae* (C) *Legionella* sp. (D) *Bordetella pertussis*

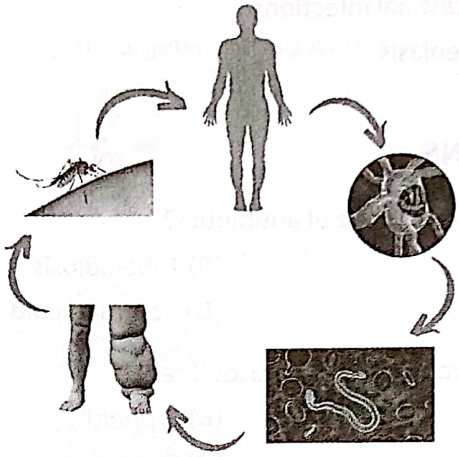
20. The group of diseases caused by bacteria are:
(A) Cholera, typhoid, mumps (B) Diptheria, leprosy, plague
(C) Tetanus, tuberculosis, measles (D) Malaria, mumps, poliomyelitis

21. Antibiotics could not always effectively treat the bacterial diseases because of:
    (A) Decreased efficiency of immune system
    (B) Insensitivity of the individual following prolonged exposure to antibiotics
    (C) The development of mutant bacterial strains, resistant to antibiotics
    (D) Inactivation of antibiotics by bacterial enzymes
22. Which of the following pathogen causes common cold?
    (A) *Plasmodium vivax* (B) Rhinoviruses
    (C) *Streptococcus pneumoniae* (D) *Salmonella typhimurium*
23. Pneumonia and common cold are different because:
    (A) Pneumonia is a non- communicable disease whereas common cold is a communicable disease
    (B) Pneumonia is caused by a virus whereas common cold is caused by a bacterium
    (C) Pneumonia causing pathogen infects alveoli of lungs whereas common cold affects nose and respiratory passage only
    (D) All the above
24. Hepatitis B can be most possibly transmitted through:
    (A) Female *Anopheles* (B) Sneezing
    (C) Coughing (D) Blood transfusion
25. During its life cycle, *Plasmodium* reproduces sexually in which of the following host:
    (A) Humans (B) Female *Anopheles* mosquito
    (C) Male *Anopheles* mosquito (D) Both (A) and (B)

SINGLE CORRECT QUESTIONS

26. Which of the following steps are not needed to be followed to maintain nail hygiene?
    (A) Clean nails by using any nail grooming tools.
    (B) Scrub the underside of nails with soap and water, every time you wash your hands.
    (C) Avoid cutting the cuticles, as they act as barriers to prevent infection.
    (D) Keeping the nails long and shape them often.
27. Which of the following disease cannot be cured by taking antibiotics?
    (A) Leprosy (B) Whooping cough
    (C) Amoebiasis (D) Plague
28. The form of TB transmitted between cattle and humans (caused by *Mycobacterium bovis*) can be prevented by:
    (A) Routinely testing cattle for TB and destroying those that test positive
    (B) Pasteurizing milk
    (C) Ensuring meat is cooked properly
    (D) All the above
29. Which of the following is an intestinal parasite which blocks the intestinal passage and its eggs are excreted along with the faeces of infected person?
    (A) *Ascaris* (B) *Wuchereria bancrofti*
    (C) *Microsporum* (D) *Epidermophyton*

30. The life cycle of *Wuchereria bancrofti* in humans is given below:



From the above figure, it can be said that the infection of *Wuchereria bancrofti* affects the:

(A) Lymphatic vessels **(B)** Blood circulation

(C) Nervous system **(D)** Respiratory system

Read the two statements carefully to choose the correct option out of the options given below.

(A) Both statements are true. **(B)** Both statements are false.

(C) Statement I is true. Statement II is false. **(D)** Statement I is false. Statement II is true.

STATEMENT BASED QUESTIONS

31. Statement I: AIDS is an infectious disease.
Statement II: Cancer is a non-infectious disease.

32. Statement I: Cancer is an acute disease.
Statement II: Hypertension is a non–infectious disease.

STATEMENT BASED QUESTIONS

33. Statement I: Dengue is a bacterial disease.
Statement II: Dengue can be treated by taking antibiotics.

34. Statement I: AIDS virus destroys the natural self-defense mechanism of the human body.
Statement II: AIDS is not a contagious disease.

STATEMENT BASED QUESTION

35. Statement I: Patient suffering from cholera frequently passes stools and repeatedly vomits.
Statement II: Cholera is caused by the pathogen virus.

MULTI CORRECT QUESTIONS

36. Which of the following are not viral and mosquito borne diseases?

(A) Filariasis and kala-azar **(B)** Typhus and diphtheria

(C) Malaria and chagas disease **(D)** Yellow fever and dengue

37. Which of the following diseases are caused by species of worms?

(A) Ascariasis **(B)** Intestinal infections

(C) Elephantiasis **(D)** Taeniasis

MULTI CORRECT QUESTIONS

38. Which of the following can be cured by the use of antibiotics?

(A) Diphtheria **(B)** Tuberculosis

(C) Typhoid **(D)** Common cold

39. Which of the following diseases are transmitted by mosquitoes?

(A) Brain fever **(B)** Typhoid

(C) Malaria **(D)** Dengue

MULTI CORRECT QUESTION

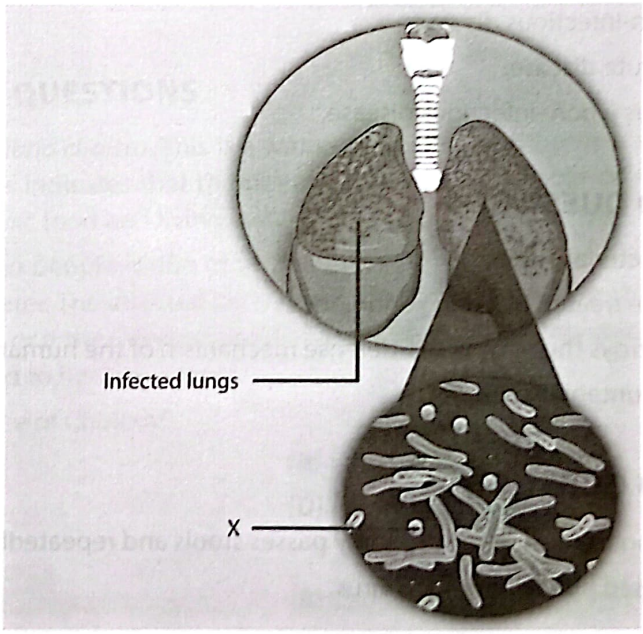
40. Which of the following are correctly matched?

(A) AIDS – Bacterial infection **(B)** Malaria – Protozoan infection

(C) Polio – Viral infection **(D)** Elephantiasis – Helminth infection

OBSERVATION TYPE QUESTION

41. Observe the given diagram illustrating the infected lungs of a person suffering from tuberculosis:



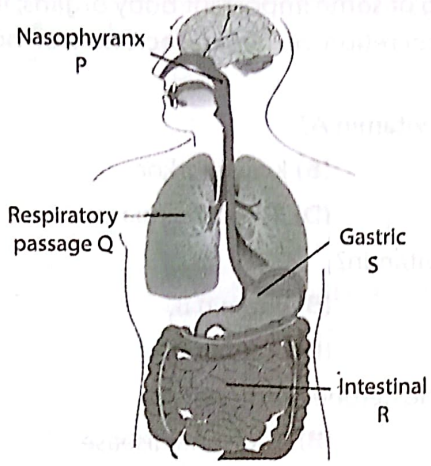
In the above figure, *X* denote the pathogen causing the disease. Identify the pathogen *X*.

(A) *Mycobacterium tuberculosis* **(B)** *Salmonella typhi*

(C) *Escherichia coli* **(D)** *Plasmodium falciparum*

OBSERVATION TYPE QUESTION

42. Observe the figure, illustrating the organs targeted during swine flu:



In the above given figure, P, Q, R, and S denote the symptoms caused in a particular organ. Identify the correct symptoms for each of the organs affected.

	P	Q	R	S
(A)	Vomiting	Diarrhoea	Fever	Lack of appetite
(B)	Lack of appetite	Vomiting	Coughing	Diarrhoea
(C)	Runny nose with sore throat	Coughing	Diarrhoea	Vomiting
(D)	Diarrhoea	Lack of appetite	Vomiting	Fever

COMPREHENSION TYPE QUESTIONS

Cholera is caused by the bacterium *Vibrio cholera*. This is a water-borne and food-borne disease (the bacterium lives in contaminated food and water). This indicates that the disease occurs where people do not have access to proper sanitation (clean water supply), hygienic food and living conditions.

Cholera can also be transmitted when people bathe or wash in contaminated water, drink contaminated water, or eat food exposed to contaminated water. The infected people egest large numbers of bacteria in their faeces. If these faeces contaminate the water supply, or if the infected people handle food or cooking utensils without washing their hands, the bacteria is then transmitted to healthy people.

43. Which of the following is the cause of Cholera?

(A) *Mycobacterium tuberculosis*
(B) *Vibrio cholera*
(C) *Escherichia coli*
(D) *Plasmodium falciparum*

44. Cholera is transmitted through:

(A) Drinking contaminated water
(B) Contamination of soil by bacteria in faeces
(C) Infected people handling food
(D) All of the above

45. Cholera is a:

(i) Air borne disease
(ii) Water Borne disease
(iii) Food borne disease

(A) (i) and (ii) only
(B) (ii) and (iii) only
(C) (i) and (iii) only
(D) (i), (ii) and (iii)

COMPREHENSION TYPE QUESTIONS

Non-infectious diseases remain confined to the person who develops them and do not spread to others. Non-infectious diseases may occur due to malfunctioning of some important body organs, inadequate diet or deficiency of nutrients, vitamins and minerals, cancer, hyposecretion or hyper–secretion of hormones, malfunctioning of immune system.

46. Which disease is caused due to the deficiency of vitamin A?

(A) Beriberi
(B) Kwashiorkor
(C) Pellagra
(D) Xeropthalmia

47. Scurvy is caused due to the deficiency of which vitamin?

(A) Vitamin A
(B) Vitamin B_1
(C) Vitamin C
(D) Vitamin D

48. Which disease occurs due to hyposecretion of aldosterone hormone?

(A) Diabetes mellitus
(B) Addison's disease
(C) Grave's disease
(D) Myxedema

MATRIX MATCH QUESTION

49. Match the columns.

Column I	Column II
(a) Amoebiasis	**(i)** *Plasmodium*
(b) Ascariasis	**(ii)** *Wuchereria bancrofti*
(c) Malaria	**(iii)** *Mycobacterium tuberculosis*
(d) Filariasis	**(iv)** *Entamoeba histolytica*
	(v) *Ascaris lumbricoides*

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

MATRIX MATCH QUESTION

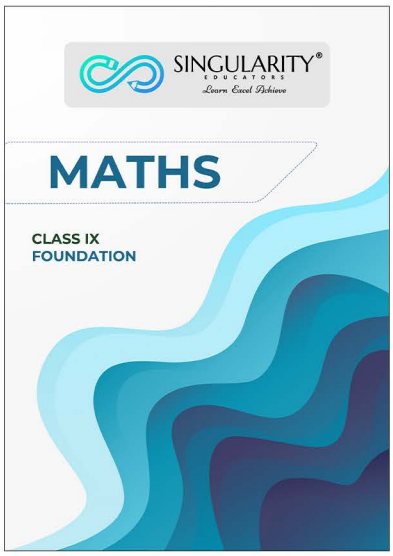
50. Match the columns for the reasons indicating the correct cause of non-infectious diseases.

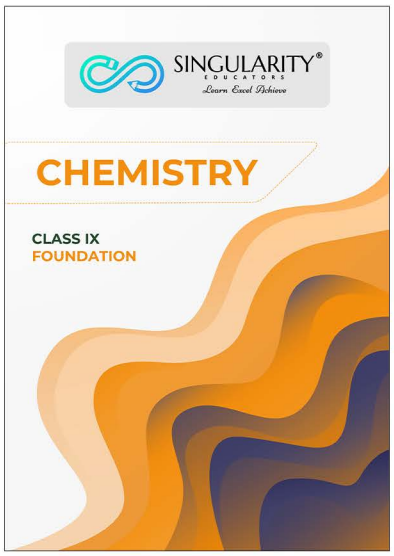
Column I	Column II
(a) Sedentary lifestyle	**(i)** Fast food that is high in fat and sugar
(b) Unhealthy eating habits	**(ii)** Angry and frustrated easily
(c) Type A personality	**(iii)** No physical activity
(d) Family history	**(iv)** Lack of exercise
	(v) Heart disease and diabetes

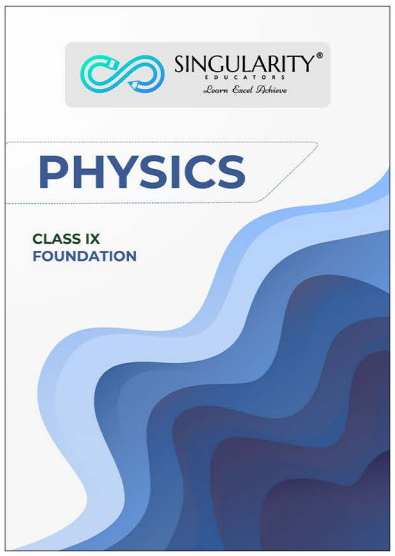
(A) a-(iii), (iv); b-(i); c-(ii); d-(v)
(B) a-(iii); b-(i), (ii); c-(v); d-(i)
(C) a-(iii); b-(iv); c-(v); d-(i), (ii)
(D) a-(iv); b-(i); c-(v), (iii); d-(ii)

KEY BOX

4. WHY DO WE FALL ILL?									
Single Correct Questions									
1	2	3	4	5	6	7	8	9	10
A	C	D	D	A	C	C	A	C	B
11	12	13	14	15	16	17	18	19	20
B	B	C	C	D	D	C	D	D	B
21	22	23	24	25	26	27	28	29	30
C	B	C	D	B	D	C	D	A	A
Statement Based Questions									
31	32	33	34	35					
A	D	B	C	C					
Multi Correct Questions									
36	37	38	39	40					
A, B, C	A, B, C, D	A, B, C	A, C, D	B, C, D					
Observation Type Questions									
41	42								
A	C								
Comprehension Type Questions									
43	44	45	46	47	48				
B	D	B	D	C	B				
Matrix Match Questions									
49					50				
B					A				







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