

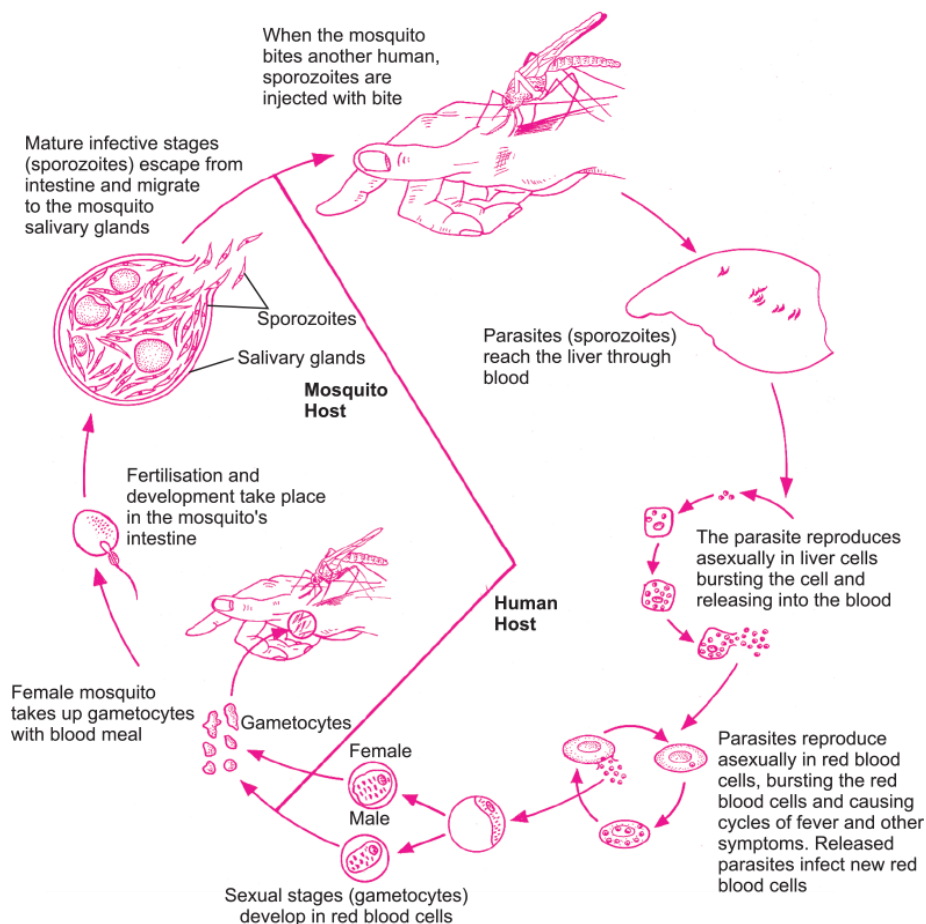
Long Answer Questions (PYQ)

[5 Marks]

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

Ans. Life cycle of Plasmodium

- Plasmodium requires two hosts to complete its life cycle—human and mosquito.
- The infected female Anopheles mosquito transfers the infectious form of Plasmodium, i.e., sporozoites to the human body by biting.
- The sporozoites reach the liver cells, where they multiply.
- This is followed by their attack on red blood cells resulting in their rupture.
- The ruptured RBCs release a toxin called haemozoin, which is responsible for high recurring fever, chills and shivering.
- These parasites enter the female Anopheles mosquitoes when they bite an infected person.
- In the body of mosquitoes, they fertilise and multiply in the stomach wall.
- Sporozoites are now stored in the salivary gland of mosquito till it is again transferred to human body by a mosquito bite. After entering the human body, all the events are repeated.

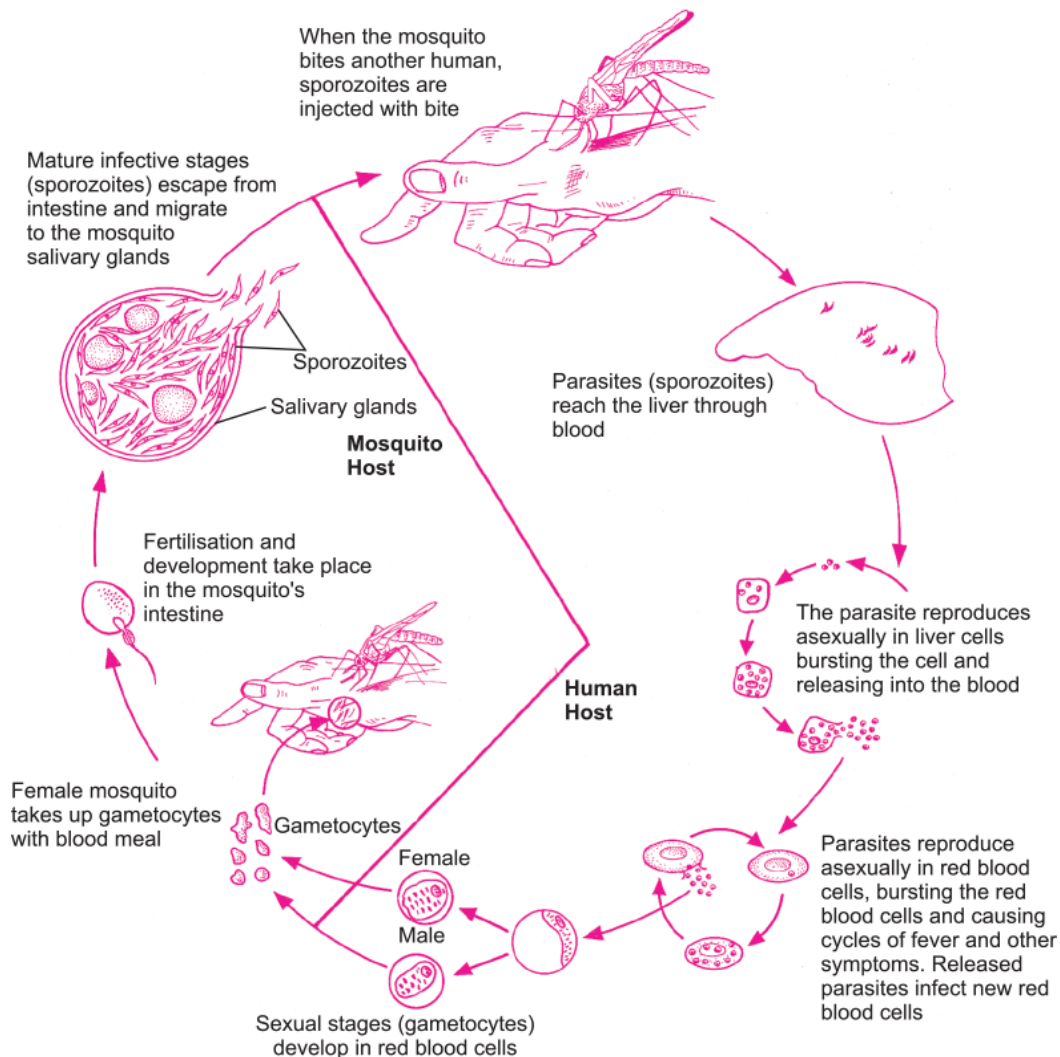


Stages in the life cycle of Plasmodium

Q.2. Name the form of *Plasmodium* that gains entry into the human body. Explain the different stages of its life-cycle in the human body.

Ans. *Plasmodium vivax*

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Stages in the life cycle of Plasmodium

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

Q. What is a vaccine? Explain how does it impart immunity to the child against the disease.

Ans.

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

Q. With the help of an example each, differentiate between active and passive immunity.

Ans.

S. No.	Active immunity	Passive immunity
(i)	It is developed due to contact with pathogen (dead or living) or its antigen, that leads to production of antibodies in the host body.	It is developed when readymade antibodies are injected into the body.
(ii)	It has no or only few side effects.	It may cause a reaction.
(iii)	It is slow but long lasting.	It is fast but lasts only for few days.
(iv)	It takes time to develop its response.	It is used when the immune response has to be faster.
(v)	For example, vaccination for polio, etc.	For example, administration of tetanus antitoxins, antibodies in colostrum, etc.

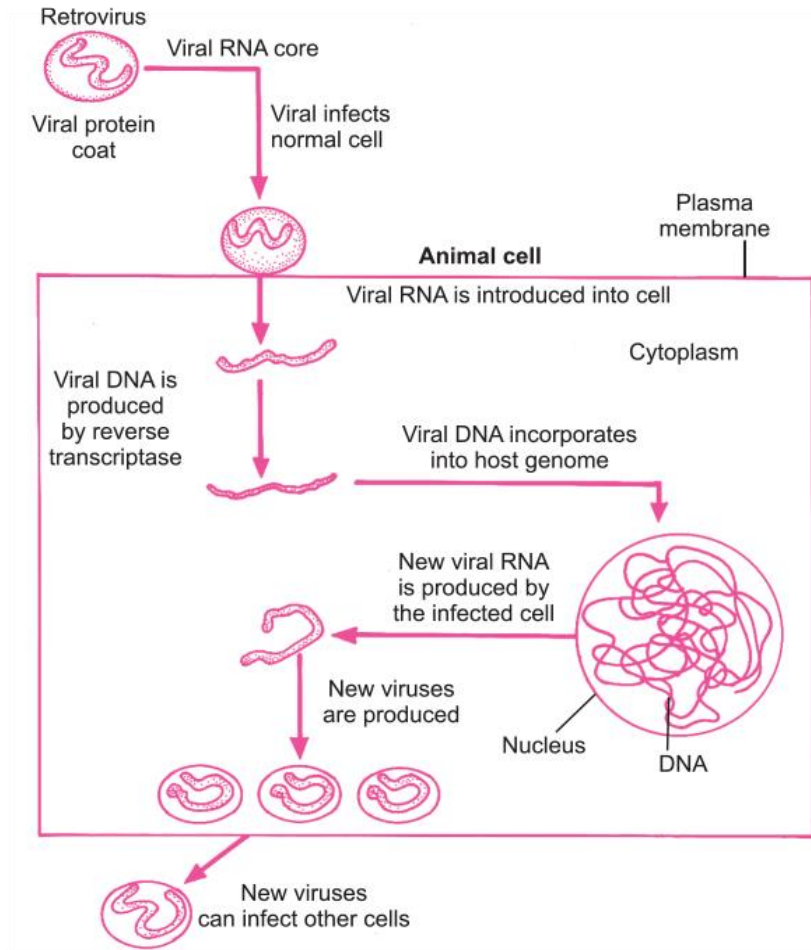
Q.4. Explain the process of replication of a retrovirus after it gains entry into the human body.

OR

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

Ans.

(a)



Replication of Retrovirus

(b) An HIV-infected patient loses immunity due to loss of T-lymphocytes.

(c) Symptoms are fever, diarrhoea, susceptibility to other diseases and prone to microbial infection.

Q.5.

- Name and explain any four lymphoid organs present in humans.
- Categorise the named lymphoid organs as primary or secondary lymphoid organs, giving reasons.

Ans.

i. **Primary lymphoid organs**

- The organs where lymphocytes originate and mature to become antigen-sensitive, e.g., bone marrow and thymus, are called primary lymphoid organs.
 - Bone marrow**
 - It is the primary lymphoid organ where all blood cells including lymphocytes originate.

- Bone marrow provides the micro-environment for the development and maturation of B-lymphocytes.
- b. **Thymus**
 - Thymus is a lobed organ located near the heart and beneath the breastbone.
 - It is quite large at the time of birth but reduces with age.
 - It provides the micro-environment for the development and maturation of T-lymphocytes.
- ii. **Secondary lymphoid organs**
 - The organs where lymphocytes interact with the antigen and proliferate to become effector cells, e.g., spleen, lymph nodes, tonsils, Peyer's patches of small intestine and appendix are called secondary lymphoid organs.
 - a. **Spleen**
 - It is a large bean-shaped organ and contains lymphocytes and phagocytes.
 - It acts as a filter of the blood by trapping blood-borne microorganisms.
 - It has a large reservoir of erythrocytes.
 - b. **Lymph nodes**
 - These are small solid structures present at different points along the lymphatic system.
 - They trap the microorganisms or other antigens that enter the lymph and tissue fluid.
 - Antigens trapped in the lymph nodes activate the lymphocytes and produce an immune response.
 - c. **Mucosal associated lymphoid tissue (MALT)**
 - It is formed of masses of lymphoid tissue lining the mucosa of respiratory, digestive and urinogenital tracts.
 - 50 per cent of the lymphoid tissue in human body is formed by MALT.

Q.6.

- a. **Cancer is one of the most dreaded diseases of humans. Explain 'Contact inhibition' and 'Metastasis' with respect to the disease.**
- b. **Name the group of genes which have been identified in normal cells that could lead to cancer and how they do so?**
- c. **Name any two techniques which are useful to detect cancers of internal organs.**
- d. **Why are cancer patients often given α -interferon as part of the treatment?**

Ans.

- a. Contact inhibition is the property of normal cells in which contact with other cells inhibits their uncontrolled growth.
Metastasis is the property in which tumour cells reach distant sites in the body, through blood.

- b. Proto oncogenes or Cellular oncogenes.
These genes when activated under certain condition could lead to oncogenic transformation of the cells.
- c. Biopsy/radiography/CT/MRI (Any two)
- d. α -interferon activates immune system and destroys the tumour.

Q.7. Your school has been selected by the Department of Education to organise and host an interschool seminar on “Reproductive Health—Problems and Practices”. However, many parents are reluctant to permit their wards to attend it. Their argument is that the topic is “too embarrassing.” Put forth four arguments with appropriate reasons and explanation to justify the topic to be very essential and timely.

Ans.

- i. The issue of puberty and adolescence need to be addressed effectively with the respective age group because many changes take place in the body during adolescence of which they are supposed to be aware of.
- ii. To bring in awareness about their reproductive health and its effect on their physical, emotional and social being.
- iii. To address the increase in sex abuse and sex crimes in our country.
- iv. Myths and misconceptions related to reproductive issues need to be cleared at the right time.

Q.8. You have attended a birthday party hosted by one of your classmates. You found some guests at the party sitting in a corner making a lot of noise and consuming ‘something’. After a while one of the boys from the group started screaming, behaving abnormally and sweating profusely. On enquiry you found that the group members were taking drugs.

Q. Would you inform your parents/school authorities? Yes/No. Give reasons in support of your answer.

Ans. Yes, so that it does not become a habit by repeated use. Consumption of drugs may cause harmful effects.

Q. Prepare a note to be circulated amongst the schoolmates about the sources and dangers of any two drugs.

Ans.

Drug	Source	Danger
Cocaine	<i>Erythroxylum coca</i>	Affects central nervous system and interferes with transport of dopamine.
Opioids/Heroin/Smack	Latex of <i>Papaver somniferum</i> (poppy plant)	Slows down body functions.

Cannabinoids	<i>Cannabis sativa</i>	Affects cardiovascular system
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Q. Write any two ways that you will suggest to your school principal so as to promote awareness amongst the youth against the use of these drugs.

Ans. Awareness can be promoted by organising poster making competitions, street plays, talks by experts and interviews of experts.

Q.9. Answer the following questions:

Q. Name and explain giving reasons, the type of immunity provided to the newborn by the colostrum and vaccinations.

Ans. Colostrum provides passive immunity, because the infant gets antibodies from the mother's body directly for protection.

Vaccinations provide active immunity because in this case microbes are injected into the body do develop immunity slowly.

Q. Name the type of antibody

- i. present in colostrum
- ii. produced in response to allergens in human body.

Ans.

- a. IgA
- b. IgE

Q.10. Answer the following questions:

Q. Name the types of lymphoid organs, lymph nodes and thymus are. Explain the role played by them in causing immune response.

Ans.

Thymus is primary lymphoid organ and lymph nodes are secondary lymphoid organs.

Thymus provides the microenvironment for immature lymphocytes to differentiate into antigen-sensitive lymphocytes.

Lymph nodes serve to trap the microorganisms or other antigens, which happen to get into the lymph and tissue fluid. Antigens trapped in the lymph nodes are responsible for the activation of lymphocytes present there and cause the immune response.

Q. Differentiate between innate immunity and acquired immunity.

Ans.

S. No.	Innate immunity	Acquired immunity
(i)	It is present from birth and is inherited from parents.	It is not present from the birth.
(ii)	It is non-specific.	It is pathogen specific.
(iii)	The various physical, physiological, cellular, cytokine barriers are the basis of innate immunity.	The memory cells formed by B and T-cells are the basis of acquired immunity.
(iv)	The innate immunity remains throughout life.	The acquired immunity can be short-lived or life long.

Long Answer Questions (OIQ)

[5 Marks]

Q.1. Write the scientific name of the bacteria that causes pneumonia. What happens in this disease? What are its symptoms?

Ans. Pneumonia

- It is caused by *Streptococcus pneumoniae* and *Haemophilus influenzae*.
- They infect alveoli (air-filled sacs) of the lungs where the alveoli get filled with a fluid resulting in the decrease of respiratory efficiency of the lungs.
- It is spread by inhaling droplets/aerosol from infected persons and sharing glasses and utensils with an infected person.

Symptoms

- a. Fever
- b. Chills
- c. Cough
- d. Headache
- e. In severe cases, lips and finger nails turn gray to bluish in colour.

Q.2. Name three species of fungi that cause ringworm. Mention the symptoms of this disease?

Ans. Ringworm

- It is caused by fungi of genera *Microsporum*, *Trichophyton* and *Epidermophyton*.
- Human infection occurs either through contact with an infected person or from soil. It also spreads through towels, clothes, combs, etc., of the infected persons.

Symptoms

- a. Dry and scaly lesions on skin, nails and scalp.
- b. Lesions are accompanied by intense itching.

Q.3. Discuss the different barrier of innate immunity.

Ans. It is accomplished by providing different types of barriers.

- a. **Physical barriers** These barriers do not allow pathogens and foreign agents to enter the body, e.g., skin, mucous membranes of digestive, respiratory and urinogenital tracts trapping microorganisms.
- b. **Physiological barriers** Sweat, tears, acid in the stomach and saliva prevent microbial growth.
- c. **Cellular barriers** WBCs (polymorphonuclear leukocytes and monocytes, natural killer lymphocytes) and macrophages phagocytose and destroy microbes.
- d. **Cytokine barriers** Interferons produced by virus-infected cells protect non-infected cells from further viral infection.

Q.4. Discuss the role of lymphoids in the immune response. Explain the different types of lymphoid organs giving two examples of each type in human.

Ans.

The lymphoid organs are those organs where lymphocytes originate, mature and proliferate for body's immune system.

Lymphoid organs are of two types:

- i. **Primary lymphoid organs**
 - The organs where lymphocytes originate and mature to become antigen-sensitive, e.g., bone marrow and thymus, are called primary lymphoid organs.
 - a. **Bone marrow**
 - It is the primary lymphoid organ where all blood cells including lymphocytes originate.
 - Bone marrow provides the micro-environment for the development and maturation of B-lymphocytes.
 - b. **Thymus**
 - Thymus is a lobed organ located near the heart and beneath the breastbone.
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 - They trap the microorganisms or other antigens that enter the lymph and tissue fluid.
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- c. **Mucosal associated lymphoid tissue (MALT)**
 - It is formed of masses of lymphoid tissue lining the mucosa of respiratory, digestive and urinogenital tracts.
 - 50 per cent of the lymphoid tissue in human body is formed by MALT.

Q.5. What are the two groups of cells that work for specific immunity? Explain four unique features of specific immunity.

Ans. T-lymphocytes and B-lymphocytes work for specific immunity. Features of specific immunity are as follows:

- i. **Specificity:** Specific antibody response to specific antigen.
- ii. **Memory:** During the first interaction of antigen with B-cells and T-cells, few cells are stored as memory cell which encounter vigorously in second infection.
- iii. **Distinction between self and non-self:** The immune system can recognise foreign particles and kill them without killing its own or self cells.
- iv. **Diversity:** The immune system provides various or diverse antibodies to kill or destroy diverse antigens.

Q.6. Explain the different ways of diagnosing cancer.

Ans. Cancer detection

- a. **Blood and bone marrow tests** are done for increased cell counts in case of leukemia.
- b. **Histopathological study or biopsy:** In biopsy, a piece of the suspected tissue cut into thin sections is stained and examined under microscope by a pathologist.
- c. **Radiography:** X-rays are used to detect cancer of the internal organs.
- d. **Computed tomography:** It uses X-rays to generate a three-dimensional image of the internal of an object.
- e. **Resonance imaging:** Non-ionising radiation and strong magnetic field are used in MRI to accurately detect pathological and physiological changes in the living tissue.
- f. **Monoclonal antibodies:** Antibodies against cancer-specific antigens are also used for detection of certain cancers

Q.7. Describe the different methods for treatment of cancer.

Ans. Cancer treatment

- The common approaches for treatment of cancer are:
 - a. **Surgery:** The tumour cells are removed with the help of surgery to check the spread of cancerous cells.
 - b. **Radiation therapy:** A lethal irradiation of tumour cell is done, taking proper care of the normal tissues surrounding the tumour mass.
 - c. **Chemotherapy:** Cancerous cells are killed by several chemotherapeutic drugs. These drugs exhibit side effects like hair loss, anaemia.
 - d. **Immunotherapy:** In this method, biological modifiers like α -interferons are used which activate the immune system and help in destroying the tumour.

Q.8. Enumerate the different measures for control and prevention of drug/alcohol abuse among adolescent.

Ans.

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

Q.9. What is cancer? How is a cancer cell different from normal cell? How do normal cells attain cancerous nature?

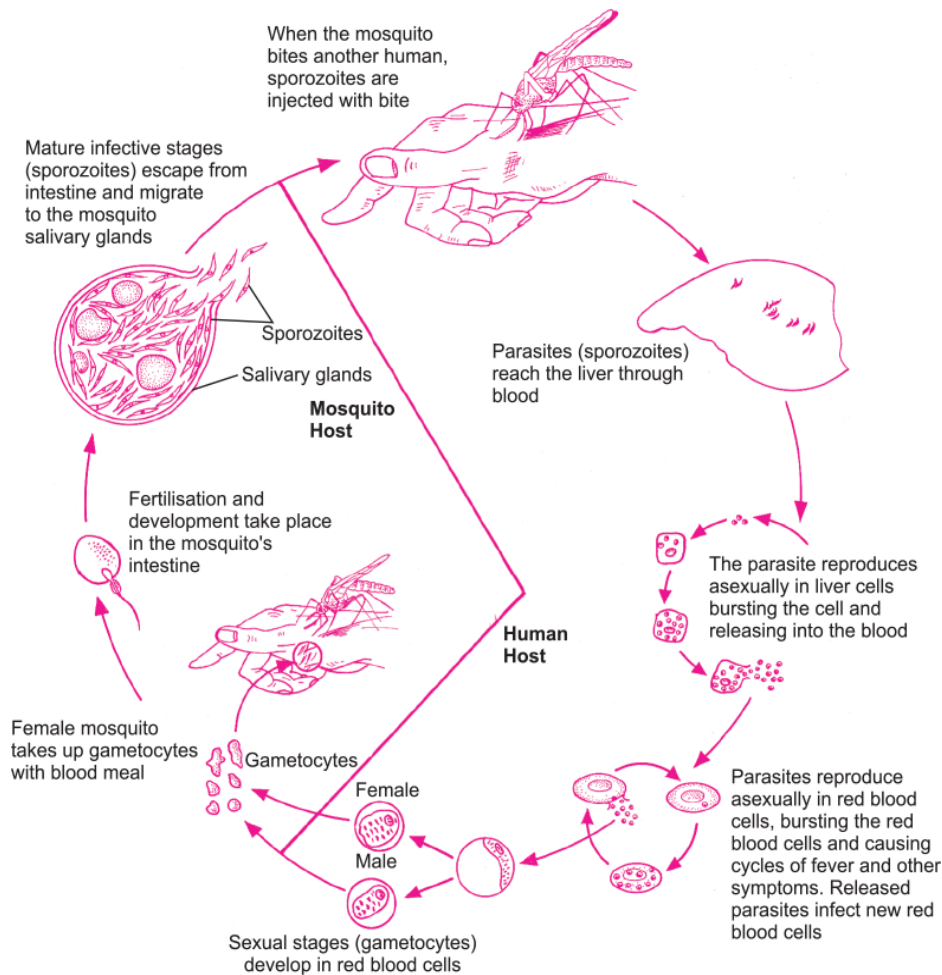
Ans. An abnormal and uncontrolled division of cells is termed as cancer.

S.No.	Cancer cell	Normal cell
(i)	Cancer cells divide in an uncontrolled manner.	Normal cells divide in a controlled manner.
(ii)		
(iii)	These cells do not show contact inhibition.	These cells show contact inhibition.
	Lifespan is indefinite.	Lifespan is definite.

In our body, the growth and differentiation of cells is highly controlled and regulated. The normal cells show a property called contact inhibition. The surrounding cell inhibits uncontrolled growth and division of a cell. The normal cells when lose this property, become cancerous, giving rise to masses of cells called tumours. Transformation of normal cells into cancerous cells is induced by some physical, chemical or biological agents (carcinogens).

Q.10. Malarial parasite '*Plasmodium*' completes its life cycle in two hosts. Draw its complete life cycle and explain various stages it follows throughout its life.

Ans.



Stages in the life cycle of *Plasmodium*

Stages:

- The stage in which the parasite enters in the body of humans through saliva of mosquito— sporozoite stage.
- Asexual reproduction of sporozoites in liver cells, resulting into bursting of those cells and releasing outside into the blood.
- Sporozoites infect RBCs, cause them to get burst and represented by repeated cycles of fever. Released parasites also infect other RBCs.
- Parasites then follow sexual stage in RBCs which is called as ring signet stage and appears as a ring inside the RBCs under microscope. Usually presence of malarial parasite in humans is identified by pathologists by this stage.
- Female mosquito takes up gametocytes with the blood of host. Fertilisation and development takes place in the intestine of mosquito.

- f. From intestine, parasite comes to the salivary glands from where it reaches to human body and that is how the cycle continues.

Q.11. Explain the following in context of cancer:

Q. Benign tumour

Ans. Benign tumours are the masses of cells which remain confined to their original location and do not spread to other parts of the body and cause little damage.

Q. Malignant tumour

Ans. Malignant tumours are the masses of proliferating cells called neoplastic or tumour cells. These grow very rapidly, invading and damaging the surrounding normal tissues.

Q. Oncogens/Carcinogens

Ans. Transformation of normal cells into cancerous, neoplastic cells may be induced by physical, chemical or biological agents. These agents are called carcinogens. For example X-rays, gamma rays, UV radiations and some chemicals like EtBr.

Q. Oncogenes

Ans. The genes which may lead to oncogenic transformations of the cells are called oncogenes.

Q. Contact inhibition

Ans. Contact inhibition—Whenever normal cells come in contact with each other, after a definite time they inhibit each other's excess growth and multiplication. This property of normal cells is called contact inhibition which maintains the normal shape and size of the body. But cancer cells appear to have lost this property which results in their uncontrolled growth and multiplication.

Q.12. Why do some adolescents start taking drugs? How can the situation be avoided?

Ans. Reasons for alcohol abuse in adolescents:

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

For measures to avoid taking drug are as follows:

- i. Avoid undue peer pressure.
- ii. Educating and counselling the problems and stresses to avoid disappointments and failures in life.

- iii. Seeking help from parents and peers.
- iv. Looking for danger signs to take appropriate measures on time.
- v. Seeking professional and medical help whenever required.