
2016

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Group 'A'

Question: 1

[1x10=10]

a. Name an organism where cell division is itself is a mode of reproduction?

Answer:

Cell division among amoeba, act as mode of reproduction.

b. Why are green algae not likely to be found in the deepest strata of the ocean?

Answer:

Survival of green algae depends upon,

- Presence of sufficient light for photosynthesis.
- Presence of brackish water.

Deep inside the sea these two conditions are not available so green algae are no present in this level, instead algae inhabit littoral zone of water.

c. Mention the scientific term used for modified form of reproduction in which seeds are formed without fusion of gametes.

Answer:

Apomixis is the scientific term used for modified form of reproduction in which seeds are formed without fusion of gametes.

d. Write the biochemical reaction of yeast fermentation of molasses for Alcohol Production.

Answer:

Alcoholic fermentation, also referred to as ethanol fermentation, is a biological process of yeast fermentation of molasses for Alcohol Production.

e. How is snow blindness caused in humans?

Answer:

High dose of UV-B radiation, inflammation of cornea.

f. India has more than 50,000 strains of rice. Mention the level of biodiversity it represents.

Answer:

Genetic biodiversity.

g. Offspring's derived by asexual reproduction are called clones. Justify giving two Reasons.

Answer:

Morphologically (structurally) is genetically identical.

h. Name the embryonic stage that gets implanted in the uterine wall of a human female.

Answer:

Blastocyst

i. Name the common ancestor of the great apes and man.

Answer:



Dryopithecus or Ramapithecus

j. Write a difference between net primary productivity and gross productivity.

Answer:

Gross productivity:

Rate of production of organic matter during photosynthesis.

Net primary productivity:

Available biomass for the consumption to heterotrophs

Group 'B'

Question: 2

Answer the following questions? (Alternatives are to be noted):

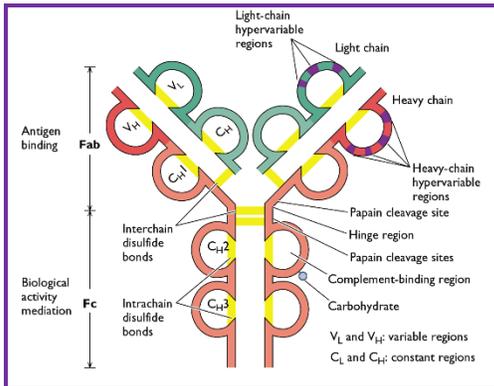
[2x7=14]

a. Explain the contribution of *Thermusaquaticus* in the amplification of a gene of interest.

Answer:

Thermusaquaticus bacterium produces Taq polymerase, a thermostable polymerase used in polymerase chain reaction. It replaced *E.coli* DNA polymerase in PCR because of the temperature conditions of PCR. Taq polymerase is able to withstand the denaturing conditions required during PCR.

OR



What does the above diagram illustrate?

Answer:

The diagram illustrates the structure of an antibody molecule.

b. Banana is a parthenocarpic fruit whereas oranges show poly embryonic. How are they different from each other with respect to seeds?

Answer:

The banana is a parthenocarpic fruit as it develops without fertilization, whereas in oranges, an embryo develops directly from a diploid cell other than egg like nucellus and integument. In banana, the ovary may develop into the fruit without fertilization. Also the parthenocarpic fruits never contain seeds whereas oranges have seeds, so in this way they differ with each other with respect to seeds.

OR



Where are fimbriae present in a human female reproductive system? Give their function.

Answer:

Fimbrias are present at the edge of infundibulum of the fallopian tube. It helps in collection of the ovum after ovulation.

c. Explain accelerated eutrophication. Mention any two consequences of this phenomenon.

Answer:

Accelerated eutrophication is addition of effluents from industries and homes that accelerates the ageing of a lake. The prime contaminants are nitrates and phosphates which act as plant nutrients. They over stimulate the growth of algae causing unsightly scum and unpleasant odours and robbing the water of dissolved oxygen vital to other aquatic life.

d. Describe the responsibility of GEAC, set up by the Indian Government.

Answer:

The Indian government has set up GEAC (Genetic Engineering Approval Committee), which takes decisions regarding the validity of GM research and safety of introducing GM organisms of public services.

OR

During the secondary treatment of the primary effluent how does the significant decrease in BOD occur?

Answer:

During the secondary treatment, the primary effluent is passed into large aeration tanks where it is continuously agitated mechanically. The air is allowed to pass through agitating mixture to make it aerobic. This allows vigorous growth of useful aerobic microbes into flock.

These microbes use the major part of the organic matter in the effluent. This considerably reduces the BOD (biochemical oxygen demand) of the effluent. The sewage water is treated till the BOD is reduced.

- e. Name the interaction in each of the following:
- Cuscuta growing on a shoe flower plant
 - Mycorrhizae living on the roots of higher plants
 - Clown fish living among the tentacles of sea anemone
 - Koel laying her eggs in crow's nest

Answer:

- Parasitism.
- Mutualism.
- Commensalism.
- Brood parasitism.

f. Why do sportspersons often fall a victim to cocaine addiction?

Answer:

Sportspersons often fall a victim to cocaine addiction because cocaine has vasoconstrictor properties. It is a powerful CNS stimulant. It induces a sense of well-being and pleasure and delays fatigue. It cause lack of sleep and loss of appetite



OR

State the difference between the first trophic levels of detritus food chain and grazing food chain.

Answer:

DFC – Dead and decaying organic matter / Dead remains of plants and animals = 1

GFC – Living green plants / producers = 1

g. Coconut palm is monoecious while date palm is dioecious. Why are they called so?

Answer:

Coconut palm produces male and female flowers in same plants.

Date palm – produces male and females flowers in separate plants.

Group 'C'

Question: 3

Answer the following questions? (Alternatives are to be noted):

[4x11=44]

a. Write the event that takes place when a vaccine for any disease is introduced in the body?

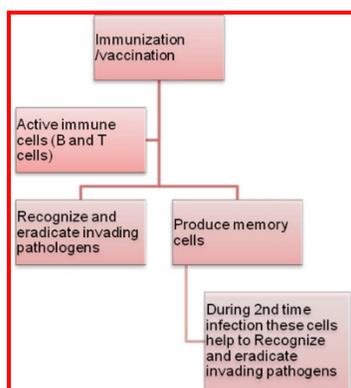
Name the bacterium responsible for the large hole seen in "Swiss cheese" what are these holes due to?

[2x2=4]

Answer:

Immunization and vaccination are based on the concept of our immune cells to generate memory cells when encounter certain infection or disease. This process includes preparation of antigenic proteins from pathogen or inactivated/weakened pathogens which are introduced into the body.

The antibodies produced against the introduced anti gen will neutralize the pathogenic effect at the time of infection.



Vaccines are mainly responsible for the activation B and T cells to recognize and eradicate invading pathogens. Frequent infection by a pathogen leads to the increase in number of memory cell, which directly increase the efficacy of response in a short time duration e.g., vaccine for tetanus, polio etc. This type of immunization is called passive immunization.

Holes present in 'Swiss cheese' are because of the production of increased amount of CO₂ by a bacterium called Propioni bacterium sharmanii. Similarly in 'Roquefort cheese' a specific fungus is used for ripening which in turn provides flavor to the chees.

OR



Why a person with is cut and bruises following an accident administrate tetanus antitoxin? Give reason. [4]

Answer:

At early stage of children's life they all are injected with some vaccines which prevent them from polio, diphtheria, pneumonia and tetanus causing microorganism.

- Administration of tetanus antitoxin after any cut or bruises elevates the rate of effective Eradication microorganism Clostridium tetani. While these anti toxins also simulate the memorycells for effective response and production of more memory cells.
- Clostridium tetani, a bacterium characterized by germ positive, rod shaped, obligates anaerobic bacterium. Infection by this microorganism release a neurotoxin called tetanospasmin which results in stiffness and contraction of muscles fibers.

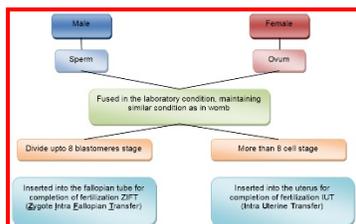
b. Suggest and explain any three ART to an infertile couple. [4]

Answer:

Infertility is now a day has become major problem among the urban areas in India, women's were always blamed for infertility without knowing root of the problem (male or female). There may be various reasons for infertility such as physical, congenital, disease, drugs, immunological or even psychological.

Now a day's specialized health care units were established for the diagnosis and assists couples looking for child the whole process is commonly known as assisted reproductive technologies (ART). These include various technologies which require highly specialized skill and expensive instrumentation.

In vitro fertilization (IVF-fertilization outside the body with maintenance of conditions that is present in the womb.) this method, popularly known as test tube baby.



Ova from the wife/donor (female) and sperms from the husband/donor (male) are collected and are induced to form zygote in the laboratory. The zygote or early embryos (with upto 8 blastomeres) is then transferred into the fallopian tube (ZIFT, Zygote Intra Fallopian Transfer) and embryos with more than 8 blastomeres, into the uterus (IUT, Intra Uterine Transfer), to complete its further development.

Embryos formed by in vivo fertilization (fusion of gametes within the female) also could be used for such transfer to assist those females who cannot conceive.

Gamete intra fallopian transfer

Ovum is collected from a donor and inserted into the fallopian tube of another female who cannot produce baby but still provide suitable environment for fertilization and further development is another method attempted.

Intra Cytoplasmic Sperm Injection (ICSI)



Here sperm is directly injected into the ovum; this procedure is used in cases where male partner is unable to inseminate the female or due to very low sperm counts during ejaculation.

Artificial Insemination (AI)

In this technique, the semen collected either from the husband or a healthy donor is artificially introduced either into the vagina or into the uterus (IUI, IntraUterineInsemination) of the female.

c. Describe how biogas is generated from activated sludge. List the components of biogas?

[4]

Answer:

Biogas is a mixture of gases (containing predominantly methane) produced by the microbial activity and which may be used as fuel. Some of the examples are fermentation, cheese making and beverage principally producing CO₂. These bacteria's are called as methanogens e.g., Methanobacterium found commonly in anaerobic sludge.

These bacteria's are present in the rumen region of cattle and goats which helps in the breakdown of the cellulose and provide nutrition and are releases in dung (gobar). Which is further used to obtain gobar gas.

Biogas plant consists of a concrete tank (10-15 feet deep) in which bio-wastes are collected and slurry of dung is fed. The biogas plant has an outlet, which is connected to a pipe to supply biogas to nearby houses. The spent slurry is removed through another outlet and may use as fertilizer.

Importance of this method is the availability of cow dung in huge amount in the ruler areas.

Components of biogas

- Gas holder
- Sludge
- Digester
- Dung water
- Inlet and outlet pipes

d. Name the pests that destroy the cotton balls. Explain the role of Bacillisthuringinesis in protecting the cotton crop against the pest to increase the yield.

[4]

Answer:

Pests which can destroy cotton balls include insects belonging to family lepidopterans (tobacco budworm, armyworm), coleopterans (beetles) and dipterans (flies, mosquitoes). Bacillus thuringiensis a bacterium which possess Bt genes which is very toxic insecticidal protein (produced at specific phase or there life cycle) and have the property to kill pest so it is designated as biopesticide.

This protein is secreted as protoxin (inactive form), once it is ingested by the pest it gets into the gut of pest where the pH acts as a catalyst for conversion protoxin to active toxin. The activated toxin binds to the surface of midgut epithelial cells and creates pores that cause cell swelling and lysis and eventually cause death of the insect.

The toxin is coded by a gene named cry. There are a number of them, for example the proteins encoded by the gene cryIAc and cryIIAb control the cotton bollworms that of cryIAb control corn borer. Specific Bt toxin genes were isolated from Bacillus thuringiensis and incorporated into the several crop plants such as Bt cotton, Bt corn, rice, tomato, potato and soybean etc.

OR



Write the importance of measuring the size of a population in a habitat or ecosystem.

Answer:

Population size is not static, keeps on changing with time depending on availability of food and predator pressure. Importantly it inform about fluctuation occurring in ecosystem due to Natality, immigration, mortality and emigration.

Natality

It is defined as the ability of an individual to produce a new individual, it is also referred to as birth rate. Natality is expressed as number of individual produced at a time.

Mortality

It is defined as the death of individual in a population; it is also referred to as death rate. Mortality is expressed as number of individual died at a given time. Mortality rate changes with respect to population and environmental condition.

Immigration

When individual of same species migrate or inhabit in a new place during a time period.

Emigration

It is the total number of people migrating from one place to inhabit a new place.

- e. Explain with the help of example how the percentage cover is a more meaningful measure of population size than mere number. [4]

Answer:

Growth of population may be result of competition or pray predator ration or use of any agent to kill organism, all these are expressed in terms of population size (designated by N). Size of a population may be determined either by calculating number of individual or by percentage cover or total biomass. Depending upon the study to be conducted we can use either of the methods.

E.g. in a given area there are 400 Parthenium plants but only a single banyan tree then it won't be correct to state that density of banyan tree is lower to that of 400 Parthenium plants, here the important determining factor will be percentage cover or the total biomass provided by the plants in comparison.

OR

Describe the endosperm development in coconut. [4]

Answer:

Formation of embryo is preceded by the formation of endosperm. The primary endosperm cell divided repeatedly and forms a triploid endosperm tissue, which are filled with reserved food material and nutrition required for development of zygote. The primary endosperm nucleus undergoes successive nuclear divisions to give rise to free nuclei.

This stage of endosperm development is called free-nuclear endosperm. Subsequently cell wall formation occurs and the endosperm becomes cellular. The number of free nuclei formed before cellularization varies greatly.

- f. Mention the name of the causal organism, symptoms and the mode of transmission of the disease Amoebiasis [4]



Answer:

Name:
Endameba histolytica

Symptoms:

Constipation, abdominal pain, cramps, mucous stool with blood clots.

Transmission:

Houseflies' carrier form feces to person via food products or contaminated water.

g. Mention the product and its use produced by each the microbes listed below: [4]

i. Streptococcus

Answer:

Streptokinase produced by the bacterium Streptococcus and modified by genetic engineering is used as a 'clot buster' for removing clots from the blood vessels of patients who have undergone myocardial infarction leading to heart attack.

ii. Lactobacillus

Answer:

Micro-organisms such as Lactobacillus and others commonly called lactic acid bacteria (LAB) grow in milk and convert it to curd. LAB produces acids that coagulate and partially digest the milk proteins. It also improves its nutritional quality by increasing vitamin B12. In our stomach too, the LAB play very beneficial role in checking disease causing microbes.

iii. Saccharomyces

Answer:

Saccharomyces cerevisiae used for bread-making and commonly called brewer's yeast is used for fermenting malted cereals and fruit juices, to produce ethanol.

iv. Why tRNA is called an adaptor molecule?

Answer:

It reads the code. It binds to specific amino acid.



h. Study the mRNA segment given above which is complete to be translated into a polypeptide chain. [1+1+1+1=4]

i. Write the codons 'a' and 'b'.

Answer:

a – AUG
b – UAA / UAG / UGA

ii. What do they code for?

Answer:



AUG codes for Methionine.

UAA / UAG / UGA – Stop codon / Nonsense codon and does not code for any amino acid.

iii. How is peptide bond formed between two amino acids in the ribosome?

Answer:

Charged tRNAs are brought closer together on mRNA in the ribosomes, ribosome acts as a catalyst forming peptide bond.

iv. Why is the polar region not a suitable habitat for tiny humming birds?

Answer:

When volume is considered surface area is large, loss of heat is more in cooler regions and difficult to generate more heat.

i. Discuss the causes and effects of global warming. What measures need to be taken to control global warming? [1+3=4]

Answer:

Global Warming Cause:

1. Carbon dioxide emissions from fossil fuel burning power plants
 2. Carbon dioxide emissions from burning gasoline for transportation
 3. Methane emissions from animals, agriculture such as rice paddies, and from Arctic seabeds
- global warming effects:

1. Rise in sea levels worldwide
 2. Massive crop failures
 3. Widespread extinction of species
- 1) Start from your home by using least utilities of heat, water, and electricity.
 - 2) Apply 3 R of Reduction, Recycle, and Reuse.
 - 3) Try to drive a smaller engine car with Euro V, or hybrid, if feasible.
 - 4) Try to car pool to work and back home.
 - 5) Try take buses or No.11 for all walkable short distance trips.
 - 6) Try to use least plastic bags or reusable bags if possible.
 - 7) Try to use less detergents, soaps, or cleaning chemicals.
 - 8) Try to sell your accumulated newspapers and cardboard boxes and bottles to local recycling agent to keep the environment clean.
 - 9) Try to donate any used furniture to the Value Village or charitable stores to keep your community clean.
 - 10) Keep your garbage container clean every day.

Steps to control global warming

1. Plant maximum number of trees as they releases oxygen and absorbs CO₂ present in atmosphere. In this way a tree balance the temperature of air and reduces the amount of CO₂ present in air.
2. Vehicles release many harmful gases in the air. Hence try to drive those cars which run on gas or electricity. If possible minimize the use of personal vehicle and travel by public transport. This way we can also control the problem of pollution.
3. Use fans more than air conditioners to use less energy. Hot air releases from air conditioner is one of the major factor behind global warming.
4. Avoid to use water heater or use that on temperature lesser than 120 F.



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5. Instead of dryers take an advantage of sun light to dry wet cloths.
 6. Unplug all the electrical appliances if they are not in use.
 7. For less amount of carbon emission we can also use renewable energy like wind power which generate negligible amount of harmful gases.
 8. Use recyclable materials instead of disposable materials. This is good to control on waste.

These are few ways through which we can try to reduce the increasing temperature of air. I would like to request to all the readers to share some more ideas which can control global warming and it's effects on environment.

- j. Define the term expanded form: [1+1+1+1=4]
i. RCH

Answer:

The Reproductive and Child Health (RCH) Programme was launched in October 1997. The main aim of the programme is to reduce infant, child and maternal mortality rates.

- ii. AIDS(Acquired Immune Deficiency Syndrome)

Answer:

It is caused by a virus. Human immuno deficiency virus (HIV). It is not contagious but it spreads through: Sexual intercourse, Blood transfusion, Sharing of needles, syringes among users of intravenous drugs, Mother to child through breast feeding and child birth, Organ transplantation.

- iii. IUDS

Answer:

The current intrauterine devices (IUD) are small devices, often 'T'-shaped, often containing either copper or levonorgestrel, which are inserted into the uterus. They are one form of long-acting reversible contraception which are the most effective types of reversible birth control.

- iv. ZIFT

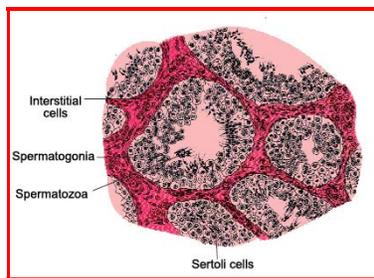
Answer:

ZIFT is an assisted reproductive procedure similar to in vitro fertilization and embryo transfer, the difference being that the fertilized embryo is transferred into the fallopian tube instead of the uterus. Because the fertilized egg is transferred directly into the tubes, the procedure is also referred to as tubal embryo transfer (TET).

- k. Draw a diagrammatic sectional view of human seminiferous tubule and label sertoli cells, primary spermatocyte spermatogonium and spermatozoa in it. Explain the hormonal regulation of the process of spermatogenesis in human. [2+2=4]

Answer:



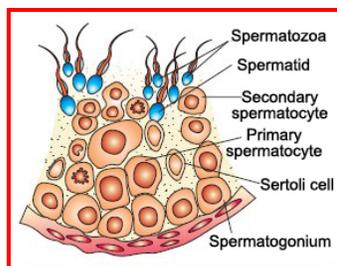


Human seminiferous tubule

- Testis, primary sex organ of male and produce gametes by the process of gametogenesis. Spermatogenesis begin at puberty, spermatogonia present on the inside wall of seminiferous tubules multiply by meiotic division and increase in numbers.

Some of the spermatogonia called primary spermatocytes periodically undergo meiosis. A primary spermatocyte completes the first meiotic division (reduction division leading to formation of two equal, haploid cells called secondary spermatocytes, which have only 23 chromosomes each.

The secondary spermatocytes undergo the second meiotic division to produce four equal, haploid spermatids.



- Spermatogenesis starts at the age of puberty due to significant increase in the secretion of **G**onadotropin **R**eleasing **H**ormone (GnRH), is a hypothalamic hormone. The increased levels of GnRH then act at the anterior pituitary gland and stimulate secretion of two gonadotropins **L**uteinising **H**ormone (LH) and **F**ollicle **S**timulating **H**ormone (FSH).

LH acts at the Leydig cells and stimulates synthesis and secretion of androgens. Androgens, in turn, stimulate the process of spermatogenesis. FSH acts on the Sertoli cells and stimulates secretion of some factors which help in the process of spermatogenesis.

- Write the changes a fertilized ovule undergoes within the ovary in an angiosperm plant. [4]

Answer:

Fertilization of ovule is preceded by the formation of male and female reproductive organs called as androecium and the gynoecium.

Ovule is also called Mega sporangium because of its large size. Ovules remain attached to placenta by the help of funicle.

Each ovule is surrounded by layers of protective covering called integuments except at the apex portion called micropyle. Integuments can further be divided into epidermis, endothecium, middle layers and the tapetum. Tapeteum provided nutrition to the growing embryo.

Each embryo sac or female gametophyte forms a megaspore by undergoing reduction division and the process is called megasporogenesis.



Ovule then differentiates into a single megaspore mother cell, which further undergoes mitotic division to form two nuclei, which after successive division forms 8 nucleate stages called female gametophyte.

Group 'D'

Question: 4

Answer the following questions? (Alternatives are to be noted):

[6×2=12]

- a. How did Oswald Avery, Colin Macleod and Maclyn McCarty prove that DNA was the genetic material, Explain? [6]

Answer:

Oswald Avery, Colin MacLeod and Maclyn McCarty worked on transforming principle given by Griffith's experiment. They purified protein, DNA and RNA from heat-killed S cells to see which ones could transform live R cells into S cells. They discovered that DNA alone from S bacteria caused R bacteria to become transformed.

They also discovered that protein-digesting enzymes (proteases) and RNA-digesting enzymes (RNases) did not affect transformation, so the transforming substance was not a protein or RNA. Digestion with DNase did inhibit transformation, suggesting that the DNA caused the transformation. They concluded that DNA is hereditary material.

OR

Explain the mechanism of sex determination in human.

[6]

Answer:

Sex determination is an illegal method for determining sex of growing child in womb. The process of sex determination is based on the pattern of chromosomal distribution in amniotic fluid surrounding the developing embryo.

Human gamete are contain 23 pair of chromosome out of which 22 pairs remain same as in male and female, the only sex determining chromos is the 23rd pair XY chromosome. Only X chromosome is found in female while male possess X and Y chromosome, recombination of XX and XY crucial in determining the sex of the child.

- XX or XY sex determination
- XX or XO sex determination

XX or XY sex determination

XX or XY sex determination is the most common form of sex determination observed among human in which female only have same kind of sex chromosome XX, while male partner have XY chromosome. Size and shape of XY differ with that of autosomal chromosome.

XX or XO sex determination

In this system of sex determination female contains XX chromosome but the male partner lack Y chromosome and is left with XO. Here sex is determined by the amount of gene expressed across the two chromosomes. This type of chromosomal combination is found in insects, grasshopper, cricket, cockroach etc.

OR

Differentiate between male heterogamete and female heterogamete with the help of an example.

[6]



Answer:

Male gamete may display two type of chromosome combination either OX or XY capable for determining the sex of the baby. This kind of variation is called as male heterogamete. Similarly when female produces two different type of gamete in relation to Z and W chromosomes is called female heterogamete.

ZW sex determination system

- Some bird, reptile and insects show heterogametic characteristics. ZW sex determination is opposite to that of present in human system with XY determinant. Here female possess ZW chromosome and male (ZZ) have only one type of chromosome.
- Female moth and some butterflies show different pairing of chromosome such as ZO or ZZW.

OR

Person in your colony has recently been diagnosed with AIDS. People/residents in the colony want him to leave the colony for the fear of spread of AIDS.

[2+2+2=6]

- a. Write your views on the situation giving reasons.

Answer:

AIDS is caused by Human Immuno deficiency Virus (HIV) belongs to the group retrovirus. It does not spread by touching or by physical contact it only spreads through the body fluid either blood or seminal fluid.

Virus enters inside the body and multiply in numbers to cause the disease or either these virus may reside in the mucosal lining where it remain latent or dormant for few years to many years. Based upon the latency this viral infection may reveal the symptom. Therefore the HIV/AIDS infected persons should not isolated from family and society; they must be loved and cared.

- b. List the possible preventive measures that you would suggest to the residents of your locality in a meeting organized by you so that they understand the situation.

Answer:

Preventive measure will include-

- ❖ Avoid multiple sexual partners.
- ❖ Always use new sterilized needle for injection.
- ❖ Always use new blades during shaving.
- ❖ Pregnant women should check whether child is infected or not.

- c. Write the symptom and causative agent of AIDS.

Answer:

Symptom

- HIV after getting in association with helper T cell and with macrophages they start to increase their number and during this period, the person suffers from bouts of fever, diarrhea, and weight loss.
- Due to decrease in the number of helper T lymphocytes, the person starts suffering from infections that could have been otherwise overcome such as those due to bacteria especially Mycobacterium, viruses, fungi and even parasites like Toxoplasma.
- The patient becomes so immuno deficient that he/she is unable to protect himself/herself against these infections.



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

Causative agent of AIDS

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

