

12<sup>th</sup>

STD

**INSTANT SUPPLEMENTARY EXAM - JUNE 2023**

**PART - III  
ZOOLOGY**

Reg. No.

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TIME ALLOWED : 3.00 HOURS]

(with Answers)

[MAXIMUM MARKS : 70

- Instructions :** (1) Check the question paper for fairness of printing. If there is any lack of fairness, inform the Hall Supervisor immediately.  
(2) Use **Blue** or **Black** ink to write and underline and pencil to draw diagrams.

**PART - I**

- Note :** (i) Answer **all** the questions. (15 × 1 = 15)  
(ii) Choose the most appropriate answer from the given **four** alternatives and write the option code and the corresponding answer.

- In which mode of reproduction variations are seen?  
(a) Asexual (b) Parthenogenesis (c) Sexual (d) Both (a) and (b)
- A contraceptive pill prevents ovulation by :  
(a) blocking fallopian tube (b) inhibiting release of FSH and LH  
(c) stimulating release of FSH and LH  
(d) causing immediate degeneration of released ovum.
- ABO blood group in man is controlled by :  
(a) Multiple alleles (b) Lethal genes (c) Sex linked genes (d) Y-linked genes
- A mRNA molecule is produced by \_\_\_\_\_  
(a) Replication (b) Transcription (c) Duplication (d) Translation
- Colostrum is rich in:  
(a) IgE (b) IgA (c) IgD (d) IgM
- The golden age of reptiles was :  
(a) Mesozoic era (b) Cenozoic era (c) Paleozoic era (d) Proterozoic era
- The Athlete's foot disease in human is caused by \_\_\_\_\_.  
(a) Bacteria (b) Fungi (c) Virus (d) Protozoan
- B cells are activated by :  
(a) Complement (b) Antibody (c) Interferon (d) Antigen
- Cyclosporin - A is an immunosuppressive drug produced from \_\_\_\_\_  
(a) Aspergillus niger (b) Manascus purpureus  
(c) Penicillium notatum (d) Trichoderma polysporum
- The first clinical gene therapy was done for the treatment of :  
(a) AIDS (b) Cancer (c) Cystic fibrosis (d) SCID

11. Organisms which can survive a wide range of temperature are called :  
(a) Ectotherms      (b) Eurytherms      (c) Endotherms      (d) Stenotherms
12. The organization which published the red list of species is:  
(a) WWF      (b) IUCN      (c) ZSI      (d) UNEP
13. Conservation of biodiversity within their natural habitat is :  
(a) Insitu conservation      (b) Exsitu conservation  
(c) In vivo conservation      (d) In vitro conservation
14. Which of the following was the contribution of Hugo de Vries?  
(a) Theory of mutation      (b) Theory of natural Selection  
(c) Theory of inheritance of acquired characters  
(d) Germplasm theory
15. Klinefelters Syndrome is characterized by a karyotype of \_\_\_\_\_.  
(a) XYY      (b) XO      (c) XXX      (d) XXY

**PART - II**

**Note :** Answer **any six** questions. Question No. 24 is Compulsory. (6 × 2 = 12)

16. What is Parthenogenesis?
17. Define gametogenesis.
18. What are holandric genes?
19. Rearrange the descent in human evolution.  
Australo pithecus → Homo erectus → Homo sapiens → Rama pithecus → Homo habilis.
20. What is Kala-azar?
21. List out chemical alarm signals produced during inflammation.
22. Define “antibiotic”.
23. What are DNA Vaccines?
24. What effect can fertilizer runoff have on an aquatic ecosystem?

**PART - III**

**Note :** Answer **any six** questions. Question No. 33 is Compulsory. (6 × 3 = 18)

25. Draw a labelled sketch of a spermatozoan.
26. Differentiate inter-sexes from Super-sexes.
27. State any three goals of the human genome Project.
28. Who disproved Lamarck's Theory of acquired characters? How?
29. Why is opsonisation efficient in phagocytosis?
30. How is milk converted into curd? Explain the process of curd formation.
31. What are transgenic animals? Give examples.
32. Differentiate Natalty and Mortality.
33. Why do we find a decrease in biodiversity distribution, if we move from the tropics towards the poles?

**PART - IV**

**Note:** Answer **all** the questions. (5 × 5 = 25)

34. (a) Explain the various barrier methods to control human population.

(OR)

(b) Give an account of genetic control of RH factor.

35. (a) Explain the formation of a Nucleosome.

(OR)

(b) Define isolating mechanism and explain its types with suitable examples.

36. (a) Explain the life - cycle of Plasmodium in man.

(OR)

(b) Explain the structure of Immunoglobulin with suitable diagram.

37. (a) What are the possible risks of GMOs?

(OR)

(b) Tabulate and analysis of two species population interaction.

38. (a) How can we contribute to promote biodiversity conservation?

(OR)

(b) How can we control air pollution?

**ANSWERS**

**PART - I**

- 1. (c) Sexual
- 2. (b) inhibiting release of FSH and LH
- 3. (a) Multiple alleles
- 4. (b) Transcription
- 5. (b) IgA
- 6. (a) Mesozoic era
- 7. (b) Fungi
- 8. (d) Antigen
- 9. (d) Trichoderma polysporum
- 10. (d) SCID
- 11. (b) Eurytherms

- 12. (b) IUCN
- 13. (a) Insitu conservation
- 14. (a) Theory of mutation
- 15. (d) XXY

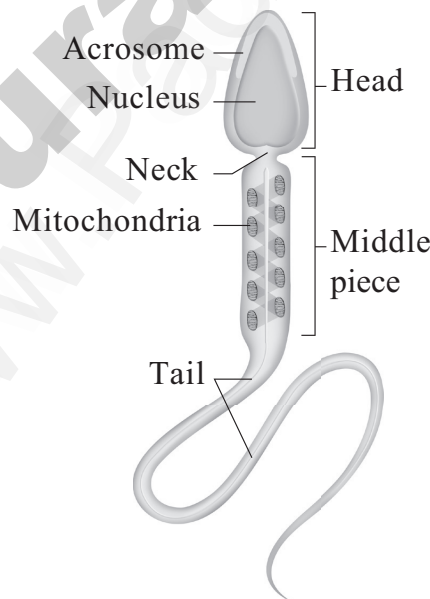
**PART - II**

- 16. Development of an egg into a complete individual without fertilization is known as parthenogenesis.
- 17. Gametogenesis is the process of formation of gametes i.e., sperms and ovary from the primary sex organs in all sexually reproducing organisms. Meiosis plays the most significant role in the process of gametogenesis.
- 18. (i) The genes present in the differential region of Y chromosome are called Y-linked or holandric genes.  
(ii) The Y- linked genes have no corresponding allele in X chromosome. Eg: Hypertrichosis  
(iii) The Y-linked genes inherit along with Y chromosome and they phenotypically express only in the male sex.
- 19. Ramapithecus → Australopithecus → Homo habilis → Homo erectus →Homo sapiens
- 20. (i) Kala – azar or visceral leishmaniasis is a protozoan disease caused by Leishmania donovani.  
(ii) It is transmitted by the vector Phlebotomus (sand fly).  
(iii) Infection may occur in the endothelial cells, bone marrow, liver, lymph glands and blood vessels of the spleen.  
**Symptoms:** Weight loss, Anaemia, Fever, Enlargement of spleen and liver.
- 21. Inflammatory barriers is a type of Innate Immunity. Tissue damage and infection induce leakage of vascular fluid containing chemotactic signals (chemical alarm signals) like serotonin, histamine and prostaglandins and produced during inflammation.

- 22. Antibiotics are chemical substances produced by microorganisms which can kill or retard the growth of other disease causing microbes even in low concentration. Antibiotic means “against life”.
- 23. (i) A DNA vaccine consists of a gene encoding an antigenic protein.  
(ii) It is inserted into a plasmid, and incorporated into the cells in a target animal.  
(iii) DNA instructs the cells to make antigenic molecules which are displayed on its surfaces.  
(iv) This would evoke an antibody response to the free floating antigen secreted by the cells.  
(v) The DNA vaccine cannot cause the disease as it contains only copies of a few of its genes.
- 24. (i) Excessive richness of nutrients in a lake or other water bodies frequently due to run of fertilizers from the land causing dense growth of plant life.  
(ii) Water pollution can cause eutrophication due to nutrient enrichment. This causes algal blooms which affect the quality of water bodies. Red tides, if occur, can be lethal to aquatic organisms.  
(iii) Natural aging of lakes also leads to nutrient enrichment of its water. In a lake, the water is cold and clear (oligotrophic stage), supporting little life.  
(iv) With time, streams draining into the lake introduce nutrients such as nitrates and phosphates, which encourage the growth of aquatic organisms.  
(v) Aquatic plants and animal life grow rapidly, and organic remains begin to be deposited on the lake bottom (mesotrophic stage).  
(vi) Nutrients stimulate the growth of algae, water hyacinth and can cause clogging of canals, rivers and lakes as well as, displacing native plants. It causes unsightly foam and unpleasant odours, and deprives the water of dissolved oxygen.

**PART - III**

25. **Spermatozoan :**



26.

S.No.	Inter Sex	Super Sex
1.	An individual showing a combination of male and female characters.	An individual showing more female characters
2.	Their chromosomal constitution is either 3A + XXY.	Chromosome constitution 2A + XXX
3.	At Sex index ratio 0.60, the organism is an inter sex.	At Sex index ratio 1.50, it becomes super sex.

27. (i) Identify all the genes (approximately 30000) in human DNA.  
 (ii) Determine the sequence of the 3 billion chemical base pairs that make up the human DNA.  
 (iii) To store this information in databases.  
 (iv) Transfer related technologies to other sectors, such as industries.  
 (v) Improve tools for analysis.
28. (i) Lamarck's "Theory of Acquired characters" was disproved by August Weismann by the experiments on mice for twenty generations by cutting their tails and breeding them.  
 (ii) All mice born were with tail.  
 (iii) Weismann proved that change in the somatoplasm will not be transferred to the next generation but changes in the germplasm will be inherited.
29. (i) Opsonisation or enhanced attachment is a type of antigen-antibody reaction.  
 (ii) It is a process by which a pathogen is marked of ingestion and destruction by a phagocyte.  
 (iii) Opsonisation involves the binding of an opsonin i.e. antibody, to a receptor on the pathogen's cell membrane. After opsonin binds to the membrane, phagocytes are attracted to the pathogen. So, opsonisation is a process in which pathogens are coated with a substance called an opsonin, marking the pathogen out for destruction by the immune system. This results in a much more efficient phagocytosis.
30. (i) The Lactic Acid Bacteria (LAB) bacteria grows in milk and convert it into curd and digesting the milk protein casein.  
 (ii) Process of curd formation: A small amount of curd added to fresh milk as a starter or inoculum.  
 (iii) It contains millions of Lactobacilli  
 (iv) Under suitable temperature ( $\leq 40^{\circ}\text{C}$ ) Lactobacilli multiply and convert milk into curd.  
 (v) Curd is more nutritious than milk as it contains a number of organic acids and vitamins.
31. (i) Transgenesis is the process of introduction of extra (foreign / exogenous) DNA into the genome of the animals to create and maintain stable heritable characters.  
 (ii) The foreign DNA that is introduced is called the transgene.  
 (iii) The animals that are produced by DNA manipulations are called transgenic animals or the genetically engineered or genetically modified organisms.  
 (iv) Examples of transgenic animals such as mice, rat, rabbit, pig, cow, goat, sheep and fish.

32.

S. No.	Natality	Mortality
1.	Natality is equivalent to birth rate and is an expression of the production of new individuals in the population by birth, hatching, germination (or) fission.	Mortality is the population decline factor and is opposite to natality.
2.	Natality rate expressed in crude birth rate number of organisms born per female per unit time.	Mortality is expressed as specific mortality, that is, the number of members of an original population dying after the lapse of a given time.
3.	Birth rate (b) = $\frac{\text{No. of birth per unit time}}{\text{Average population}}$	Death rate (d) = $\frac{\text{No. of deaths per unit time}}{\text{Average population}}$

33. (i) Temperature, precipitation, distance from the equator (latitudinal gradient), altitude from sea level (altitudinal gradient) are some of the factors that determine biodiversity distribution patterns.
- (ii) The most important pattern of biodiversity is latitudinal gradient in diversity. This means that there is an increasing diversity from the poles to equator.
- (iii) Diversity increases as one moves towards the temperate zones and reaches the maximum at the tropics. Thus, tropics harbour more biodiversity than temperate or polar regions, especially between the latitudes of 23.5°N and 23.5°S. Harsh conditions exist in temperate areas during the cold seasons while very harsh conditions prevail for most of the year in polar regions.

**PART - IV**

34.

- (a) **Barrier methods:** In these methods, the ovum and sperm are prevented from meeting so that fertilization does not occur.
- (i) Chemical barrier Foaming tablets, melting suppositories, jellies and creams are used as chemical agents that inactivate the sperms in the vagina.
- (ii) Mechanical barrier Condoms are a thin sheath used to cover the penis in male whereas in female it is used to cover vagina and cervix just before coitus so as to prevent the entry of ejaculated semen into the female reproductive tract. This can prevent conception. Condoms should be discarded after a single use. Condom also safeguards the user from STDs like AIDS. Condoms are made of polyurethane, latex and lambskin. Diaphragms, cervical caps and vaults are made of rubber and are inserted into the female reproductive tract to cover the cervix before coitus in order to prevent the sperms from entering the uterus.
- (iii) Hormonal barrier It prevents the ovaries from releasing the ova and thickens the cervical fluid which keeps the sperm away from ovum. Oral contraceptives — Pills are used to prevent ovulation by inhibiting the secretion of FSH and LH hormones. A combined pill is the most commonly used birth control pill. It contains synthetic progesterone and estrogen hormones. Saheli, contraceptive pill by Central Drug Research Institute (CDRI) in Lucknow, India contains a non-steroidal preparation called Centchroman.



(iv) Intrauterine Devices (IUDs) Intrauterine devices are inserted by medical experts in the uterus through the vagina. These devices are available as copper releasing IUDs, hormone releasing IUDs and non-medicated IUDs. IUDs increase phagocytosis of sperm within the uterus. IUDs are the ideal contraceptives for females who want to delay pregnancy. It is one of the popular methods of contraception in India and has a success rate of 95 to 99%. Copper releasing IUDs differ from each other by the amount of copper. Copper IUDs such as Cu T-380 A, Nova T, Cu 7, Cu T 380 Ag, Multiload 375, etc. release free copper and copper salts into the uterus and suppress sperm motility. They can remain in the uterus for five to ten years.

Hormone-releasing IUDs such as Progestasert and LNG – 20 are often called as intrauterine systems (IUS). They increase the viscosity of the cervical mucus and thereby prevent sperms from entering the cervix. Non-medicated IUDs are made of plastic or stainless steel. Lippes loop is a double S-shaped plastic device.

(OR)

(b) Fisher and Race hypothesis:

(i) Rh factor involves three different pairs of alleles located on three different closely linked loci on the chromosome pair. This system uses the 'Cde' nomenclature.

(ii) Possible genotypes are

- One C or c
- One D or d
- One E or e

Eg: CDE / cde      CdE / cDe  
       cde / cde      CDe/ CdE

All genotypes with dominant 'D' produces Rh positive phenotype of double recessive genotype 'dd' produces Rh negative phenotype.

Wiener Hypothesis:

- (i) Wiener proposed the existence of eight alleles ( $R^1, R^2, R^0, R^z, r, r^1, r^{11}, r^y$ ) at a single Rh locus.
- (ii) All genotypes with dominant 'R allele' ( $R^1, R^2, R^0, R^z$ ) will produces Rh positive' phenotype and double recessive genotypes ( $rr, rr^1, rr^{11}, rr^y$ ) produces Rh-negative phenotype.

35.

- (a) (i) Chromatin is formed by a series of repeating units called nucleosomes.
- (ii) Korenberg proposed a model for the nucleosome, in which 2 molecules of the four histone proteins H2A, H2B, H3 and H4 are organized to form a unit of eight molecules called histone octamere.
- (iii) The negatively charged DNA is wrapped around the positively charged histone octamer to form a structure called nucleosome.
- (iv) A typical nucleosome contains 200 bp of DNA helix.
- (v) The histone octameres are in close contact and DNA is coiled on the outside of nucleosome.
- (vi) Neighbouring nucleosomes are connected by linker DNA (H1) that is exposed to enzymes. The DNA makes two complete turns around the histone octameres and the two turns are sealed off by an H1 molecule.
- (vii) Chromatin lacking H1 has beads on a string appearance in which DNA enters and leaves the nucleosomes at random places.

- (viii) H1 of one nucleosome can interact with H1 of the neighbouring nucleosomes resulting in the further folding of the fibre.
- (ix) The chromatin fiber in interphase nuclei have a diameter of 700 nm and represents inactive chromatin. 30 nm fibre arises from the folding of nucleosome, chains into a solenoid structure having six nucleosomes per turn. This structure is stabilized by interaction between different H1 molecules.
- (x) DNA is a solenoid and packed about 40 folds.
- (xi) In a typical nucleus, the chromatin that is tightly packed (stained darkly) is called heterochromatin.
- (xii) Euchromatin is transcriptionally active and heterochromatin is transcriptionally inactive.

(OR)

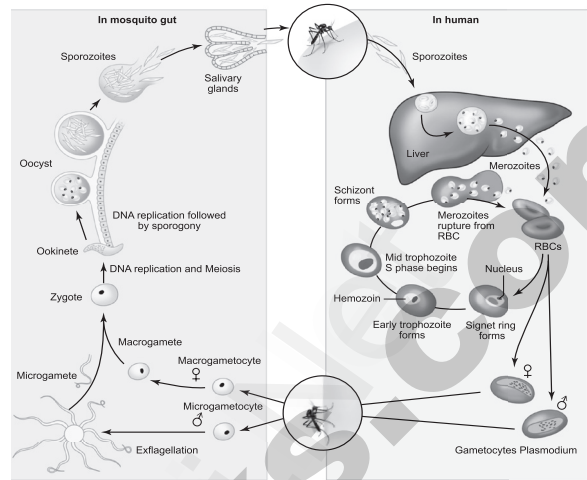
- (b) Isolation is the separation of the members of a single population into sub-populations so that genetic integrity of the sub-population can be maintained.
- (i) **Ecological isolation or habitat isolation-** The members of the same population may be separated from one another by differences in their habitat.  
**Eg:** *Rana areolata* occupies burrows dug by mammals and tortoises during the day and breeds in grassy shallow ponds whereas *Rana grylio* breeds in deep waters. Due to the difference in their habitat, the two species are able to maintain their respective species identities.
  - (ii) **Seasonal isolation** - Differences in the breeding seasons prevents interbreeding.  
**Eg:** Toad, *Bufo americanus* breeds much early in the spring whereas *Bufo fowleri* breeds very late in the season. They maintain their species identity because of the differences in the breeding seasons.
  - (iii) **Sexual or ethological isolation/Behavioural isolation** – Prevents mating due to the difference in their sexual behavior. The species are not separated from one another either in time or in space.  
**Eg:** The mating calls of two closely related species of frogs, grey tree frog and pine wood tree frog are different which prevents interbreeding.
  - (iv) **Morphological isolation or mechanical isolation:** – Differences in their external genitalia that is seen in two different species.  
**Eg:** The size difference between two toad species, prevents their interbreeding.
  - (v) **Physiological isolation** – Though mating may occur, the gametes are prevented from fertilization due to mechanical or physiological factors.  
**Eg.** The sperms of *Drosophila virilis* survive only for about a day when introduced into the sperm receptacle of *Drosophila americana* while the sperms of *Drosophila americana* live for a longer time.
  - (vi) **Cytological isolation** – Fertilization does not take place due to the differences in the chromosome numbers between the two species, the bull frog and gopher frog.
  - (vii) **Hybrid inviability** – The sperm enters the egg, fertilization occurs and the embryo develops into the adult but it dies before reaching maturity.  
**Eg.** Fishes, frogs, beetles, even if fertilization takes place between two species, due to genetic incompatibility they do not leave any surviving offspring.
  - (viii) **Hybrid sterility** – Hybrids are formed due to inter-specific crosses but they are sterile due to the failure of the chromosomes to segregate normally during meiosis.  
**Eg.** Mule (inter specific cross between a horse and a donkey).
  - (ix) **Hybrid breakdown** – F1 Hybrids are viable and fertile, but F2 hybrids may be inviable or sterile.



36.

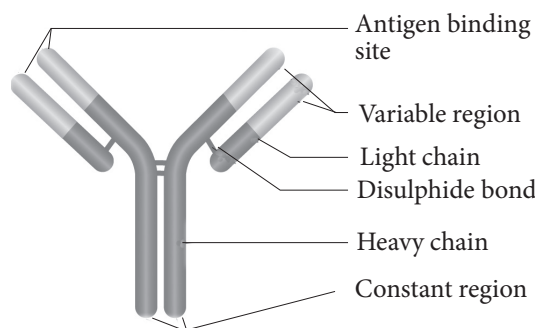
(a) **Life cycle of Plasmodium:**

- (i) The life cycle of *Plasmodium* involves three phases namely **schizogony, gamogony and sporogony.**
- (ii) The parasite first enters the human blood stream through the bite of an infected **female Anopheles** mosquito.
- (iii) As it feeds, the mosquito injects the saliva containing the **sporozoites.**
- (iv) The sporozoite within the blood stream immediately enters the hepatic cells of the liver
- (v) It undergoes multiple asexual fission (**schizogony**) and produces **merozoites** which are released from liver cells.
- (vi) The merozoites penetrate the RBC's. Inside the RBC of blood, the merozoite begins to develop as unicellular trophozoites. The trophozoite grows in size and a central vacuole develops pushing them to one side of cytoplasm and becomes the **signet ring stage.**
- (vii) The trophozoite nucleus then divides asexually to produce the **schizont.** The large schizont shows yellowish - brown pigmented granules called Schuffners granules.
- (viii) The schizont divides and produces mononucleated merozoites.
- (ix) Eventually the erythrocyte lyses, releasing the merozoites and haemozoin toxin into the blood stream to infect other erythrocytes.
- (x) Lysis of red blood cells results in cycles of fever and other symptoms.
- (xi) This erythrocytic stage is cyclic and repeats itself approximately every **48 to 72 hours** or longer depending on the species of *Plasmodium* involved. The sudden release of merozoites triggers an attack on the RBCs.
- (xii) Sometimes, merozoites differentiate into **macrogametocytes** and **microgametocytes.** When these are ingested by a mosquito, they develop into male and female gametes respectively.



(OR)

- (b)
  - (i) In the 1950s, experiments by **Porter and Edelman** revealed the basic structure of the immunoglobulin.
  - (ii) An antibody molecule is Y shaped structure



Structure of immunoglobulin

- (iii) It comprises of 4 polypeptide chains, **two identical light chains** (L) of molecular weight 25,000 Da (approximately 214 amino acids)
- (iv) **Two identical heavy** chains (H) of molecular weight 50,000 Da (approximately 450 amino acids).
- (v) The polypeptide chains are linked together by di-sulphide (S-S) bonds.
- (vi) One light chain is attached to each heavy chain
- (vii) two heavy chains are attached to each other to form a Y shaped structure. Hence, an antibody is represented by  $H_2 L_2$ .
- (viii) Each chain (L and H) has two terminals. They are C - terminal (Carboxyl) and amino or N-terminal.
- (ix) Each chain (L and H) has two regions.
- (x) They have variable (V) region at one end and a much larger constant (C) region at the other end.
- (xi) Antibodies responding to different antigens have very different (V) regions but their (C) regions are the same in all antibodies.
- (xii) In each arm of the monomer antibody, the V regions of the heavy and light chains combines to form an antigen – binding site shaped to ‘fit’ a specific antigenic determinant.
- (xiii) Consequently each antibody monomer has two such antigen – binding regions.
- (xiv) The (C) regions form the stem of the antibody monomer that determine the antibody class and serve common functions in all antibodies.

37.

(a) GMOs stands for Genetically Modified Organisms. The possible risks of GMO's include:

Environmental	Health	Agricultural
Toxins in pest-resistant GMOs could negatively impact non-target organisms and harm ecosystems.	Proteins transcribed and translated from transferred genes could cause allergic reactions in humans or other animals – currently GM foods are not properly labelled.	GMOs with pest toxins could increase evolution of resistance in certain pest populations.
Cross-species pollination could spread herbicide resistance genes and create 'super-weeds'.	Antibiotic resistance genes used as markers during gene transfer could spread to pathogenic bacteria.	Big biotech companies hold monopolistic legal rights (patents) over GM seeds.
Biodiversity could be negatively affected by destruction of pests, weeds, and even competing plants.	Transferred genes could mutate and cause unexpected risks.	GMOs do present two major agricultural problems in the forms of pesticide- and herbicide-resistance.

(OR)

(b)

S. No.	TYPES OF INTERACTION	SPECIES 1	SPECIES 2	GENERAL NATURE OF INTERACTION	EXAMPLES
1.	Amensalism	-	0	The most powerful animal or large organisms inhibits the growth of other lower organisms	Animals destroyed at the feet of elephants
2.	Mutualism	+	+	Interaction favourable to both and obligatory	Between crocodile and bird
3.	Commensalism	+	0	Population 1, the commensal benefits, while 2 the host is not affected	Sucker fish on shark
4.	Competition	-	-	Direct inhibition of each species by the other	Birds compete with squirrels for nuts and seeds.
5.	Parasitism	+	-	Population 1, the parasite, generally smaller than 2, the host	<i>Ascaris</i> and tapeworm in human digestive tract.
6.	Predation	+	-	Population 1, the predator, generally larger than 2, the prey	Lion predatory on deer

38.

(a) Conservation of biodiversity is protection and scientific management of biodiversity so as to maintain it at its optimum level and derive sustainable benefits for the present as well as future generations. It aims to protect species from extinction and their habitats and ecosystems from degradation.

General strategies in conservation

- (i) identify and protect all threatened species
- (ii) identify and conserve in protected areas the wild relatives of all the economically important organisms
- (iii) identify and protect critical habitats for feeding, breeding, nursing, resting of each species
- (iv) air, water and soil should be conserved on priority basis
- (v) wildlife Protection Act should be implemented

(OR)

(b) Certain measures help to remove pollutants, reduce their presence or prevent their entry into the atmosphere.

- (i) Trees are the best remedy for urban particulate and gaseous pollution.
- (ii) Forests act as carbon sinks and lungs of the planet.
- (iii) Catalytic converters in vehicles help to reduce polluting gases drastically.
- (iv) Diesel exhaust filters in automobiles cuts particulates.
- (v) Electrostatic precipitators reduce, release of industrial pollutants.
- (vi) Cost effective air pollution treatment systems like indoor plants and high performance biofilters can improve indoor air quality.

