DOMESTICATION OF ANIMALS & ECONOMIC ZOOLOGY

INTRODUCTION

The rearing of animals for specific purposes is called domestication, and such animals are called domestic animals. Domestication of animals started during the 'hunting and gathering phase' of human civilization. Man domesticates a variety of animals for food transport agricultural operation, wool, fur, study, research and pleasure. Cow buffaloes, goats, sheep and pigs for meat and honey bee for honey. Cattles, horses, mules, donkeys, camels, elephants and reindeer are used for transport. The domesticated animals play an important role in the economy of rural India. The first animals to be domesticated may have been the dog and goat. The various breeds of domestic animals we use today have evolved from wild ancestors through selective breeding. Pets, livestock, poultry, Fishery, Sericulture, apiculture and Lac culture are briefly discussed in this chapter. The branch of agriculture specializing in the breeding raising care and utilization of domestic animals is known as animal husbandry.

3.1.1 DOGS AND CATS

Dogs and cats are the closest pets of man. They are carnivores turned omnivores. They occurs wild in various parts of the world.

(i) **Dogs :** Dog was among the earliest animals domesticated by man. A large number of breeds have been produced by intensive inbreeding and artificial selection of a single ancestral dog species. These vary in form colour, size and fur. It has proved to be a faithful companion and guard of its master. The domestic dog, canis familiars, is found in almost all countries. It is useful in many ways.

(a) It can be trained to protect flocks (sheep or goat) and herds (cattle).

- (b) It is helpful in tracking and running down the game such as hare and fox.
- (c) It is a very useful animal for hunting.

(d) Some breeds, which have sharp sense of smell and sight, are employed to trace the criminals drug peddlers and prowleres.

(e) It can lead the blind persons.

(f) Eskimos use dogs to pull sledges (wheel less vehicles used over snow or ice).

(g) Dog raising is a profitable business. Pedigree dogs fetch high return.

(h) Dog is a symbol of loyalty.

(ii) **Cats :** Cat felis domesticus is a small, furry mammal. It has many breeds. It is domesticated to eradicated rats and mice. It is also a nice pet.

3.1.2 LIVESTOCK

(i) **Meaning of livestock :** The word livestock refers to the domestic animals kept or dealt in for use or profit. It includes cattle, buffaloes, sheep, goats, pigs, horses, mules, donkeys and camels. The most important of these are cattle and buffaloes.

(ii) **Cattle** (*Bos indicus*) **Buffaloes** (*Bos bubalus*) : The word cattle includes cow (adult female), bull (uncastrated adult male), bullock or OX (castrated adult male) and steer (young castrated male).

(iii) **Importance of cattle and Buffaloes :** Cattle and buffalo are most important forms of domesticated animals. They are next to land in use for farmers. They are widely used for :

(a) **Agricultural Operations :** Cattle are used in agricultural operations such as ploughing, harrowing and levelling land; in harvesting and thrashing ripe crops; and in working wells, etc.

(b) **Milk :** Cows and buffaloes provide milk, an important human food with all the essential materials.

(c) **Transport :** Cattle are employed in cart driving to transport men and materials. However, they are being fast replaced by machines.

(d) **Manure and fuel :** The dung provided by them acts as a valuable manure for maintaining the fertility of the soil. It is also used for preparation of biogas or gobar gas. Dung cakes provide cheap fuel to the poor, but the fields get deprived of an important manure.

(e) Leather : Hides obtained from these animals are used for the preparation of leather goods.

(f) Glue and gelatin : Their bones, horns and hoofs yield glue and gelatin.

(g) Meat : Beef and buffalo meat are eaten by certain people

(h) Hair : Hair are used for making brushes.

(i) Hybridisation : Indian bulls are used for

(iv) **Breeds of cattle :** There are 26 breeds of cattle and 7 breeds of buffaloes in India. They differ in colour, general body build, form of horns, forehead and geographical distribution. The best cattle breeds occur in the drier regions of the country. The most important breeds of milk cows in the United States of America are **Holstein-Friesian**, Jersey, Quernsey, Ayrshire and Brown Swiss. Depending upon the utility, the cattle are classified into the following groups;

(a) Milch breeds that give good milk-producing cows,

(b) **Draught breeds** which give good working bullocks,

(c) **General utility (dual-purpose) breeds** the females of these breeds are good milk-producers and the bullocks are good draught animals.

Some breeds of mulan Cattle			
Milch Breeds	Distribution		
1. Gir	Gujrat, Rajasthan		
2. Sahiwal	Punjab, Haryana, Uttar Pradesh		
3. Red Sindhi	Andhra Pradesh		
4. Deoni	Andhra Pradesh		
Drought Breeds			
1. Malvi	Rajasthan, Madhya Pradesh		
2. Nageri	Delhi, Haryana, Uttar Pradesh		
3. Hallikar	Karnataka		
4. Kangayam	Tamil Nadu and other parts of South India		
General Utility Breeds			
1. Haryana	Haryana, Punjab, Bihar, Madhya Pradesh, Gujrat		
2. Ongole	Andhra Pradesh		

Some Breeds of Indian Cattle

3. Kankrej	Gujrat
4. Tharparkar	Andhra Pradesh, Gujrat

Murrah	Punjab, Haryana, Uttar Pradesh
Bhadawari	Uttar Pradesh, Madhya Pradesh
Jaffrabadi	Gujrat
Surti	Rajasthan, Gujrat
Mehsana	Gujrat
Nagpuri or Ellichpuri	Central and South India
Nili Ravi	Punjab, Haryana

Some Breeds of Indians Buffaloes

(v) Feeding of cattle : The cattle feed consists of two components (a) Roughage (b) Concentrates.

(a) **Roughage :** Roughage includes fodder, silage, hay and straw. They have a large amount of fibre contents and low nutritive value.

(b) **Consentrates :** The consentrates used in the cattle feed is a mixture of substance which are rich in nutrient contents. Cotton seeds, oil seeds, oil cakes, cereal grains like bajra, gram, rice polish, etc. are some important substances included in the concentrates in the cattle feed. In the winter season, cattle are given green fodder, mainly berseem and lucerns. In other seasons, cattle are given maize, bajra, jowar and dry fodder.

Cattle should be given sufficient water daily. Suckling calves also need water.

(vi) **Breeding of Cattle :** Cattle breeders select and mate best type of cattle for a particular purpose. The breeding of cattle is done by two methods i.e. natural and artificial.

(a) Natural breeding : It is further of two types *i.e.* random and controlled

(1) **Random breeding :** Here some pedigree bulls are kept along with the grazing cows. Bulls not selected for breeding are castrated and changed to bullocks.

(2) **Controlled breeding :** In this type of breeding native cows are crossed with superior quality of imported bulls in natural breeding. Foreign dairy breeds like Jersey (England), Holstein Freisian (Holland), Brown Swiss (Switzerland), Ayrshire (Scotland) have been imported to give better results. Hybrid cows yield more milk and hybrid oxen comparatively more active and energetic. Some improved hybrids are Jersey Sindhi, Brown Swiss Sahiwal, Ayrshire Sahiwal etc.

(a) **Artificial breeding :** The introduction of semen (sperm) in the body (vagina) of females by artificial means is called **artificial insemination**. This method is comparatively better and economical. Several cows can be inseminated by semen of a single bull.

(b) **Superovulation and Embryo transplantation :** This is a recent technique that has been introduced in India to produce super milch cows.

(vii) **Breeding and Calving Season :** In India the breeding season commences from September and continues upto February, and the calving season from July to November. During this breeding period, the bulls have been found to be very active sexually and the quality and quantity of semen are very high, particularly during winter (November to February). The she buffaloes show the maximum of ovarian activity and the largest percentage of them conceive during this period.

(viii) **Length of Gestation :** The length of gestation of buffaloes varies, influenced by breed and environment, between 276 and 340 days, but on an average, it lasts for 307 days or 10 months, in contrast to the cow with an average gestation of 284 days or 9 months.

(ix) **Duration of lactation, Dry period and interval between calving :** In milch buffaloes, the average period of lactation is 281 days, a dry period of 139 days and an interval between calving of 420 days is normal. This means that, on the average, a buffalo cow produces a calf at 14 months intervals.

(x) **Important livestock diseases :** Just like human beings, livestocks like cow, buffalo, etc. Suffer from various diseases. The diseases in livestock are mainly caused by the attack of micro-organisms like virus, bacteria or fungi, or by an attack of worm parasites. Some important livestock diseases are as follows.

- (a) Viral diseases : Foot and mouth diseases, pox.
- (b) Bacterial diseases : Rinderpest, tuberculosis, anthrax.
- (c) Fungal diseases : Ringworm.

3.1.3 SHEEP AND GOATS

There are many breeds of sheep (*ovis aries*) and goats (*Capra hircus*) in our country. Today sheep are raised in all parts of the world. Sheep provide us with wool, skin and mutton and goats provide us with milk, meat, skin and hair. The fine soft wool called **pashmina** is the underfur of Kashmir and Tibet goats. A sheep lives for about 13 years.

(i) **Feeding of sheep and goats :** Sheep feed on green tender grass or weeds or other herbage. Goats feed on a variety of trees by browsing on the buds and foraging on a variety of plants. Oil cakes and mineral mixture are also fed to keep sheep in good condition.

(ii) **Breeding of sheep and Goats :** To improve the quality of a sheep, cross-breeding experiments are usually done. For this purpose, a good quality wool yielding or mutton producing sheep is chosen and cross breed with exotic breeds like Dorset, Horn and Merino. About 19% of world goat population occurs in India. These differ in body build, colour, horn size, ear size, hair texture, etc. The wild goat, *Capra hircus*, of Baluchistan and shind is the ancestral stock of all the breeds of domestic goat.

Breed	Distribution	Use	
1. Lohi	Punjab, Rajasthan	Good quality wool, milk	
2. Rampur-Bushair	Uttar Pradesh, Himachal	Brown coloured ficece	
	Pradesh		
3. Nali	Haryana, Punjab, Rajasthan	Superior-carpet wool	
4. Bhakarwal	Jammu and Kashmir	Under-coat used for high quality	
		woollen shawls	
5. Deccani	Karnataka	Mutton, no wool	
6. Nellore	Maharashtra	Mutton, no wool	
7. Marwari	Gujrat	Coarse wool	
8. Patanwadi	Gujrat	Wool for army hosiery	

Some breeds of Indian Sheep

Name	Distribution
1. Gaddi and Chamba	Himachal Pradesh
2. Kashmiri and Pashminu	Himachal pradesh, Kashmir, Tibet
3. Jamunapari	Uttar Pradesh, Madhya Pradesh
4. Beetal	Punjab
5. Marwari	Rajasthan
6. Berari	Maharashtra
7. Malabari	Kerala
8. Bengal	Bihar, Orissa

Important Breeds of Indian Goats

(iii) **Shearing of wool :** The shearing of wool is essential to promote the health of sheep. The removal of hairs (wool) from the sheep is done very carefully in the mild weather. The recommended periods for shearing of wool are winter (February- March) and rainy (August-September) seasons when rich grazing ground is available. The sheep are washed properly before the removal of hairs.

The manufacture of wool from sheep hairs is a complicated process consisting of cleaning, drying, bleaching, dyeing, spining and twisting.

(iv) Common diseases of sheep and goats

(a) **Sheeps :** These include haemorrhagic septicaemia, anthrax, sheep-pox and black-quarter. The common signs of illness are high temperature, cessation of rumination, hard breathing, coughing, sneezing, diarrhoea and drooping gait. The sheep also suffer from external and internal parasites.

Timely inoculation prevents the diseases.

(b) Goats : The goats are less prone to serious diseases. They suffer from some contagious diseases such as anthrax, goat pox, pleuropneumonia and foot and mouth disease. The general signs of illness are as in the cows. Parasitic infection is common in goats.

3.1.4 PIGS

Pig, also called hog or swine, is an omnivorous, nonruminant, gregarious mammal of genus *Sus*. All breeds of pigs have descended from the European wild boar *sus scrofa* or a crossbreed of this and the Asiatic species, *S. indicus*. The care and management of pigs is called piggery.

Pigs are the most prolific breeders and quick growers among the domestic animals. A group of 10 sows (Female hog) and one boar may produce over 160 piglets in a year. Pigs are most useful domestic animals, especially of lower classes of society. They are most economical source of meat and animal fat. Pig meat, in general, is known as pork and the meat obtained from different parts of the body have been given different names, for example bacon obtained from the back and sides and ham from the back of the thigh. Sausages are prepared by freshminced pork, free form bone and skin. The fat of pig squeezed from the body tissue is termed as lard. Lard is used as a fine cooking medium and in the

manufacture of soaps lubricants, greases, candles and water proof materials. The wiry and stiff hairs obtained from the back and neck of the pigs and wild boars are known as bristles. The rough and coarse bristles are generally used for varnish work and painting brushes. The hide is used as leather and pig droppings are a good source of nitrogen, phosphorus and potassium for agricultural fields.

(i) **Feeding of pigs :** Indigenous pigs survive through scavenging on kitchen wastes and farm by products and human faeces. Pig keepers raise them on grass, straw roots and grains. As they can feed on human faeces, they serve as secondary host for tape worms.

(ii) **Breeds and breeding of pigs :** Pig breeding has now started on commercial scale. The improved exotic types, number of which is insignificant is maintained mostly at all the seven Regional Pig Breeding stations of the country. Some breeds of the pigs are given in table.

Breeds	Distribution	
Native Pigs		
1. Desi	Uttar Pradesh, Bihar, Punjab, Madhya	
	Pradesh	
2. Ghori	Manipur, Assam, Meghalaya, Arunachal	
	Pradesh	
Exoti	c pigs	
1. Berkshire	U.K.	
2. Large White Yorkshire	U.K.	
3. Landrace	Switzerland, Denmark	

Important Breeds of Pigs

(iii) **All India Co-ordinated research project :** The ICAR initiated an All India Co-ordinated research projects on pigs during the fourth five year plan. The project started functioning early in 1971. The main objective of the projects is to develop suitable breeds using imported stock. The centres where this project is in operation are :

- 1. Indian Veterinary Research Institute, Izatnager
- 2. Assam Agricultural University, Khanapara,
- 3. Andhra Pradesh Agricultural University, Tirupathi
- 4. Jawaharlal Nehru Krishi Viswa Vidyalaya, Jabalpur.

(vi) **Diseases of Pigs :** These include swine fever, foot and mouth, swine-pox, swine-plague, anthrax, tuberculosis, infectious dysentery and piglet influenza. General signs of illness are as in sheep and goats.

3.1.5 Horses

(i) **Distinguishing Features :** The horses (*Equus cabalus*) are solid-hoofed, non-ruminant quadrupeds with long, pendant mane and tail bearing long hair all over. They are intelligent animals. They learn fast are faithful pets and can adapt to all sorts of climatic conditions.

(ii) **Feeding :** Horses are fed on oats, barley, gram and hay. Common salt is also added to their diet. Green grass may also be given if available.

(iii) **Breeding :** If compared to other animals, horses have a low reproductive rate. Controlled natural mating in horses has been in practice in India for a long time. A high professional skill is required for rearing, training and medical care of race horses.

Name	Regions
1. Kathiawari	Rajasthan and Gujrat
2. Marwari	Rajasthan
3. Bhutia	Punjab and Bhutan
4. Manipuri	North-eastern mountains
5. Spiti	Himachal Pradesh
6. Zanskari	Ladakh

Important	breeds	of Indian	Horses
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3.1.6 DONKEYS

(i) **Distinguishing Features :** Donkeys are smaller than horses but have larger head, longer pinnae and narrower hoofs. Their mane is erect and tail has a tuft of hair at the tip.

(ii) **Feeding :** The donkeys mainly feed on straw and fodder. They are often let free to graze on the roadside.

(iii) **Breeding :** There are two breeds of donkeys in our country : small, dark grey and large, light grey to almost white. The grey donkey occurs in most parts of the country. The white donkey, also called wild ass, occurs in Rann of Kutch. Donkeys have descended from the wild ass *Equus asinus* of Abyssinia.

3.1.7 MULE

Mule is the hybrid between male ass (jack) and female horse (mare). It has the stamina of ass and size of horse, but is sterile. Similarly, the cross between male horse (stallion) and female ass is called **hinny**.

Mules are known for their toughness. Since they are sexually sterile, they have to be produce every time a new.

(i) **Feeding :** They are fed mainly on green fodder, crushed grams and barley. They are also given salt.

(ii) **Breeding :** Indian army has imported male donkeys from Europe for breeding mules. Army uses tow type of mules : (a) General service type and (b) Mountain artillery type. The latter are firm footed and can carry heavy loads on steep terrain.

(iii) **Common Disease of Equines :** The horses, donkeys and mules suffer from many diseases. They include pink eye or influenza, strangles, tetanus, colic etc.

3.1.8 CAMELS

The camel is a large, horn less, ruminant mammal of genus *Camelus*. It is popularly called "the ship of the desert" because of its great travelling power in a desert. It is a valuable beast of burden in hot desert and semidesert regions as it can live on minimum food and water when travelling with load.

(i) Types of camels : There are two types of camels :

(a) **Arabian camels** (*Camelus dromidarius*) : With a single hump, short hair and found in north Africa to India. It does not occur in wild form.

(b) **Turkish or bactrian camel** (*Camelus bactrianus*) : With two humps, long hair and found in Gobi desert of central Asia. It occurs in wild form also.

(ii) **Feeding :** Camels are fed on dry fodder (barley, straw) supplemented with chopped green fodder made of pulses, mustard and green pees. They browse on trees, shrubs and bushes. The size of the hump is a good indicator of its health.

(iii) **Breeding :** There are four kinds of camels in India. These are Jaisalmeri, Sindhi and Bikaneri found in Rajasthan and Kutchi found in Gujrat. They have a well-defined breeding season. Camels breed in winter (November to March).

(iv) **Diseases :** Camels suffer diseases such as anthrax, pneumonia, camel-pox and surra.

3.1.9 ELEPHANT

Elephants are chiefly found in forests with tall trees where bamboo's grow in profusion. They have very poor sight but sense of hearing and smell is highly developed.

(i) **Feeding :** Daily food intake is considerable, but only partially digested and utilization is low. Natural food includes bamboo shoots, leaves and various fruits. Working elephant are fed straw, hay and crushed grain as a supplement.

(ii) **Breeding :** Puberty occurs at between 8 and 12 years. The gestation period is 21 - 22 months. The calving interval is 4 years. Elephants may live for up to 90-100 years. Elephants are of two types : African elephants and Indian elephants.

	Indian elephant (Elephas	African elephant (Laxodonta
	maximus)	africans)
1. Physical Features	Small ears, High domed	Large ears convex sloping
	forehead with 2 prominance on	forehead.
	top of skull. One process on	
	trunk tip Convex backed. Tusks	
	in males only, not always	
2. Mature at	25 years	25 years
3.Weight at maturity	Male 3000 kg	Male 6000 kg
4.Geographical	Ceylon, India, Burma, Thailand,	East, Central and West Africa
distribution	Vietnam, Laos, Malaysia,	
	Indonesia	
5. Uses	Timber extraction and log	Very limited. In small area of
	moving in forested areas	Zaire, used for timber transport.

Differences between Indian Elephant and African Elephant

3.1.10 YAK

Yak is found in Tibet, Ladakh, Lahaul, Spiti, Garhwal and Sikkim. It gives meat, hide and wool. Yak is also used for tilling land. The transport of people and goods in these regions would be impossible without this animal.

Imortant Tips :

- *s* Super ovulation is a technique where a cow is made to ovulate more ova by injection of hormones.
- \sim The average yield of buffalo is 495 kg. with 6.5 7.5 percent fat.
- *The Breeding season for buffaloes –September to February.*
- *Gastroenteritis is the second highest cause of buffalo calf mortality.*
- The uterine and ovarian cycle of buffalo is 21 days (variations present).
- Franswiss (hybrid breed of livestock) was developed at NDRI, kanal, while sunandini was developed at NDRI Kerala.
- *The sector of the sector of t*
- ☞ Milk yield/cow/yr. in U.S.A. is 4250 kg. and 220 kg in India.
- Sex vigour in buffalo increases in colder season.

3.1.11 SERICULTURE

Sericulture is the breeding and management of silk worms for the production of silk. It has been practiced in India since second era or century B.C. The silk which is produced by silk worm is of a valuable natural protein fibre. Silk worms are the larvae of silk moths. The rearing of silk worm for the production of silk is known as **sericulture**.

(i) **History of silk :** Historical account of use of silk and rearing of silk worm eggs, larvae and cocoons are available from china. It was Lotzu the empress **kwang-Ti** who for the first time discovered the silk thread and its source the silk worm cocoon. The technique of sericulture was kept as a secret by the chines people. In about 550 B.C. The sericulture technique was diffused to European countries. The available mythological literature deals with facts rearing the use of silk in ancient India. By about 1000 A.D. the sericulture was in practice in China, Europe and India, China was the leading country in this field.

At present the sericulture is practiced in China, Japan, Korea, India, Brazil, Russia, France and Italy. Some of the south east asian countries. China is topmost country producing some 48% cocoons and 40.9% of row silk. Next biggest silk producing country is Japan, India is placed in third position as for as the production of silk in term in quantity is concerned.

(ii) **Silk in India :** As far as silk as a fabric is concerned it is a matchless fabric second to none. Therefore, silk garments have been a favourite choice since ancient times. Use of silk clothes finds its mention from pre-historic period. There are description of use of silk clothes from vedic period. In Ramayana and Mahabharat period the silk clothes adored the bodies of royal princess, prince, kings and queens. It attire of the rich people. The silk clothes were used to the superiority of social and economic status. It was given in gifts by rich people and royal families.

In the medieval period the silk was a recognised commodity of commerce. The silk clothes and raw silk were imported from **China** and **Japan**. Later on it was also imported from Europe. By the Moghul period India had a rich heritage of silk clothes. The silk was imported as raw silk. It was spun into silk thread and silk clothes were woven in handlooms silk clothes became almost a craze among royal families and rich persons. A number of such looms were in operation in Banaras, and different parts of Uttar Pradesh, Kashmir became centres for the production of cocoons and rearing of silk worm. Sporadic silk textile centres were also present in South India. It was in 1905-1906 that a scientific investigation in the field of sericulture was undertaken in India by the Indian Institute of Agricultural Research at Pusa, New Delhi. It was Lefroy who conducted research on the silk worm and potentialities of silk production in India. A series of exhibitions were organised to popularize silk and attract the attention of scientists and industrialists as well towards sericulture in India.

By 1910 India started regular production of raw silk. The rearing of *Bombyx mori* and *Autheraea* species was undertaken. Silk textile industry was finally established in **Kashmir**, **U.P.** and **Karnataka**. Silk garments were exported by this time. Silk clothes from **Bengal**, **Banaras** and **karnataka** were famous even in the European markets.

(iii) Silk in Modern Age : Sericulture as well as silk industry is firmly established in India. India at present is the third biggest country in the field of silk production and only next after China and Japan.

The reasons for the poor growth of sericulture in India were:

(a) High cost of production.

(b) Low yield.

(c) Poor quality of raw silk.

But the recent efforts by the Government of India and various state governments such as research in sericulture and training in sericulture technique, development of silk worms marketing facilities and cultivation of plants, e.g. *Morus indica* or shahtoot *Norus alba* or 'Toot' castor sal etc. Central Sericulture Station, Berhampore, Central Research and Training Centre, Mysore and Ranchi have been established. Various states have undertaken a programs of research, training and plantation of host plants under their rural development programs. As a result of these efforts new varieties of mulberry plants have been developed and are being cultivated. These varieties are called as M₂ and M₅ varieties. They gave 100% increased yield of mulberry leaves upon which the silk worm feeds.

Different varieties of silk worm, *Bombyx mori* and *Autherea* have been developed which can be cultivated in various states. Existing races of silk worm are being improved Bivoltine species are being developed. Low production and higher yield have been achieved as a result of these efforts. India is producing 4200 metric tons of silk per annum (1980). This figure is even higher at present. India is exporting some 25% to 30% of its total silk production in the form of silk garments and fabrics. Karnataka is the biggest silk producing state followed by Jammu & Kashmir and Tamil Nadu, Madhya Pradesh is also emerging on the scene of silk production. India is producing China silk, Tasar silk or Cosa silk, Muga silk and Eri silk today.

Largest silk producing state of India is Karnataka.

The zoological name of common silk worm is Bombyx mori

or

Silk is obtained from *Bombyx mori*.

(iv) Systemic position :

Phylum-ArthropodaClass-InsectaOrder-Lepidoptera

Family - Bombicidae and satarnidae

(a) Family – Bombicidae

(1) **Bombyx mori :** It is known as China silk worm or mulberry silk worm. It is native of China. It has been fully domesticated for the production of silk. It produced quality of silk which is white silk or yellow silk.

(2) Other species of *Bombyx* are *B. texior*, *B. fortunatax* and *B. meridionles*. They are well Known in our country.

(b) **Family – Saturnidae :** Antheraea paphio - It belong to the family saturnidae. It is widely distributed in india in the states of Karnataka, Tamilnadu, Madhya Pradesh, Uttar Pradesh, Bihar and West bengal. It feed on and fig plants. Its favourite host plant is Arjun (*Terminalia arjuna*) sol (*shorea robusta*). It has been recently domesticated for sericulture. It produced Tassar silk (kosa silk.)

(v) **Habit and habitat :** The silk worm distributed in temperate regions are diapause type i.e. they remain inactive for some time in winter. The silk worms inhabiting some tropical regions. Are of non - diapause type they are holometabolous. The life cycle stages include egg- larvae-pupa and imago

(vi) **Adult Moth :** The moth measures about 25 mm in length and wing span measures about 40-50 mm in width. Female moths are larger than male moths. In general univoltine races are of larger size that multivoltine.

It has whitish colour with gray marks on wings in some races. The body is divisible into head, thorax and abdomen. Head contains a pair of eyes and a pair of pectinated antennae specially larger in males. Thorax contains three pairs of legs and two pairs of wings covered with scales. Female moths are without mouth. The abdomen is plump. Digestive system is poorly developed. The excretory system consists of three pairs of malpighian tubules present at the end of mid gut. The reproductive system is very well developed in females and males.

(vii) Life History

(a) **Copulation :** The copulation lasts for about three hours. During copulation the male sits over the female and holds her with the help of chitinous hooks. Both the moths acquire back to back' position. The female has a scent gland at the terminal end of the abdomen, which secretes volatile secretion called pheromones to attract the male.

(b) **Egg :** Copulation is immediately followed by egg laying. The eggs are small, oval and creamy white in colour. They become darker as they become older. Each moth lays about 500 to 2000 eggs. The eggs are glued to the under-surface of the leaves of the host plant.

In univoltine egg's hatching takes place after one year. In multivoltine it takes place after 10-12 days.

(c) **Larva :** After hatching a larva comes out of egg. It is called as caterpillar larva. It is 1.2 mm to 3 mm in length depending upon the race. It has grey or creamy-white colour.

The body of larva is divided into head, thorax and abdomen. The head consists of three fused segments. Mouth parts are biting and chewing type or strongly mandibulate. A pair of antennae and six pairs of are also present on head. Mandibulate mouth parts are used to cut and chew the leaves. The thorax consists of three segments. Each segment contains a pair of legs with recurved hooks. They are used for locomotion and manipulation of food during feeding. The abdomen consists of ten segments. The last and tenth segment is poorly developed. Five pairs of pseudo legs are present on 3^{rd} , 4^{th} , 5^{th} , 6^{th} and 9^{th} abdominal segments. These are used for locomotion.

Silk is the secretion of salivary gland

• Silk gland : Among other visceral organs larva contains well-developed paired glands called

silk glands. When fully developed, these glands becomes five time larger than the length of the larva and there weight becomes 2/5th of the total body weight. Each gland is divisible into an anterior, a middle and a posterior region. The middle portion is broad and is called as reservoir. The anterior and posterior parts are narrow. The anterior parts of both the silk glands are united to form a common duct which opens through a spinneret situated on hypopharynx. The posterior coiled part of gland



secretes a protein called as fibroin. It is covered and surrounded by sericin secreted by middle part. A pair of accessory glands or the glands of felippi open the duct of silk gland. Its secretion probably lubricates the silk. The silk is secreted in liquid form, which solidifies on coming in contact with air.

The larva is voracious eater. It feeds on mulberry leaves. It may ingest about 30,000 times more than its body weight during its complete larval period and increases about 10,000 times more than the body weight of its body from the time of hatching. As the larva grows, it sheds it cuticle. This is called as moulting. The form of larva between two successive moults is called as **instar**. The larva has five instars:

Ist instar - from hatching to Ist moult IInd instar - between Ist moult and IInd moult IIIrd instar - between IInd moult and IIIrd moult IVth instar - between IIIrd moult and fifth moult Vth instar - between fifth moult and pupation

A fully-grown larva of Vth instar attains the length of 7.5 cm. It stops feeding and starts spinning the cocoon. It secretes silk thread from its spinneret and forms covering in which it encloses itself completely. It takes about 3-4 days to spin the cocoon.

(d) **Pupa :** The cocoon consists of silk thread. The enclosed immobile larva in the cocoon is called as **Pupa**. The pupal stage is non- feeding and non-mobile. It remain & inactive. But the internal organs undergo drastic changes collectively called as metamorphosis and transforms itself into imago.

(e) **Cocoon :** The cocoon is white or yellow in colour. It is made up of about 1000-1200 meters long silk thread. The thread is wound around the cocoon is concentric circles. The weight of one cocoon is about 1.8 to 2.2 gms. The pupal period lasts for about 10 to 12 days. Alkaline fluid which makes the threads of cocoon to be soft. Soft threads are cut open by the imago. A young moth comes out of cocoon.

Factors influencing the life cycle : The life cycle is influenced by the external environmental factors, such as, temperature, humidity and light. These factors control the growth of the larvae and

also the quality of silk produced. The growth and moulting is controlled by hormones called juvenile hormone and ecdysone.

(f) **Fertilization :** After the moths emerge out from cocoons one female from one lot is kept with the male from another lot. They form pair and copulate. After copulation is over separated and kept with female of another lot. Thus one male can be used to fertilize at the most two females of different lots.

(g) **Egg laying :** After fertilization the female starts laying eggs. Egg laying is completed in about 24 hours. The laid eggs are called seeds. The eggs are transferred in sterilized and tray stored at 4°C.

(viii) **Composition of silk :** The silk is a secretory product of silk glands of the larva. Silk is composed of proteins. It consists of an inner part made up of fibroin protein (C_{30} H₄₆ N₁₀ O₁₂) and is covered with an outer envelope made up of sericin protein (C_{30} H₄₀ N₁₀ O₁₂). The silk thread contains 75-80% fibroin and 20-25% of sericin,

(ix) **Sericulture industry :** Sericulture industry involves three steps, (a) mulberry cultivation (b) silkworm rearing and (c) silk reeling.

(a) **Mulberry cultivation :** Mulberry is the only food of silkworms. Mulberry plants come up in any soil and in any climate. It is propagated by cuttings. The land is ploughed well 6 or 7 times in April-May and manured at the rate of 2 to 25 tons per hectare. Small pits are scooped out 2 or 3 cuttings are lanted in pit. Each cutting should be 20 to 23 cm in length with nodes. When the plants grow too high they are cut back and this is known as pruning. **Pruning**. Pruning will help in the production of a new flush of leaves. The plants can yield for 12 years. Every year 6 to 8 crops of leaves can obtained and the average yield per hectare is 25 to 30 metric tons of green leaves.

Species – morus indica, morus alba.

(b) Silk worm rearing – Silk worm rearing needs the following:

- Rearing house
- Rearing trays and stands
- Chandrikes as support to build the cocoon.

The hybrid eggs are obtained from the sericulture department. The larvae are hatched from the eggs. The newly hatched larvae are brushed into rearing trays and tender, chopped are provided to them. Fresh leaves are offered 3 to 6 times a day and the old unconsumed leaves are cleaned periodically. From the fourth instar onwards, whole fresh leaves can be given. The consumption of leaves by the larvae increases with their age. At the end of the final instar, fully grown mature larvae are transferred from the rearing trays to chandrikes and allowed to build cocoons. Cocoons are then collected and marketed.

Grainage Management : This is done to provide good quality of seed to rearers and also to maintain the original quality. With this air grainage management is done by taking of caterpillar stage. They are protected from diseases and are provided good nutrition. An initial selection is made by observing pupal mortality rate. If the mortality rate is high, then such cocoons are rejected and are not kept for seed production. If the mortality rate is sufficiently low, their only such cocoons are selected and kept for seed production. The selected cocoons are kept for mass emergence. Before doing so the cocoons are examined and sexed. Males are kept separately and females are kept in separate lots.

(c) **Hatching :** The process by which larvae come out of the egg is known as hatching. After hatching larvae start eating mulberry leaves. The success of sericulture depends on the supply of good quality of mulberry leaves; therefore the hatching must coincide with good mulberry season. Now a days controlled hatching is done by placing the eggs in low temperature. The eggs are turned and moved with the help of a feather. Now -a-days the eggs are kept in mulberry leaves in sterilised trays. If hatching is to be delayed or controlled, the eggs are kept in separate trays and refrigerated for a suitable time.

The caterpillars which hatch out are kept in separate groups according to their age.

(d) **Supply of seeds to rearers :** Under this step the are supplied with seeds. The seeds are of two qualities, i.e., eggs and 2nd instar larvae. Beginner rearers are supplied with 2nd instar larvae, which experienced rearers can purchase egg. This is important operation. For this purpose government has established many silk worm seed centres from where the rearers get their seeds at fair price.

(e) **Rearing of Caterpillars :** The caterpillars are reared at room temperature in shady places at about 60 to 70% humidity. The mulberry leaves supplied to Ist and 2nd instar larvae are well chopped, fresh and kept in wet clothes so as to keep them fresh. The caterpellars eat voraciously and grow in size and moult. The form of larvae between two successive moults is known as instars. Larvae have five instars. The last or 5th instar larvae stop feeding and undergo pupation.

(1) **Spinning of Cocoons :** Full grown 5th instar larvae secrete a pasty material from its silk gland. It moves its head to and fro, secreting a silk thread. The spinning larvae are picked up and kept in spinning trays. The trays are kept in slanting position towards the sun. Within a period of three days spinning is and larvae are transformed into pupae enclosed in cocoons.

A good quality of cocoon is judged by the quantity of raw silk, filament length, strength and splitting power. The cocoons are marketed and sold.

(2) **Post Cocoon Processing :** It included following stages:

• **Stifling :** The process of killing the cocoons is termed as stifling. Eight to ten day-old cocoons are selected and dipped in hot water to kill the pupae in the cocoons. If cocoons are not dipped in hot water the silk worm cuts hole in the cocoon and hence the silk thread is destroyed.

• **Reeling :** The silk threads from the killed cocoons are removed and wound round a large wheel and then transferred to spools. This operation is called as reeling and the silk is called as reeled silk.

• **Spinning :** Damaged cocoons or the damaged outer layer of silk is separated and spun into threads. This is known as spun silk.

The raw silk is boiled, stretched, purified and washed again and again to shining lustre. Reeled silk or spun silk is marketed and sold.

(x) **Problems of Sericulture :** The sericulture industry is facing a number of problems.

(a) **Need for Research :** There is a great need to better methods of rearing the silk worms. This is necessary to improve the yield of raw silk and reduce the cost of production.

(b) In order to improve the quality and yield of raw silk improved varieties of silk worm are developed by hybridization and breeding. There is a need for the improvement of genetic quality of the silk worm.

For research and training in sericulture the Government has opened Research and Service Station in many states. A Central Silk Board has been established at Bangalore the ministry of commerce. (c) **Diseases :** A number of diseases are caused to silk worm. These diseases result in the low yield and reduce the quality of silk.

Disease of silkworm

(1) **Pebrine :** It is the most important disease of silkworms. It is caused by a sporozoan called **Nosema bombycis.** The full grown caterpillar is attacked. The infection spreads successive generations through eggs of a infected moth therefore eggs from healthy moths alone should be taken for rearing worms.

(2) **Muscardine :** It is a fungal disease caused by **Beauveria bassiana** and transmitted by spores carried by winds. All stages of caterpillar are attacked.

(3) **Flacherie :** It is a bacterial disease caused by **Bacillus bombysepticus.** Digestion in the affected caterpillar gets disturbed Regular feeding of the larvae and maintaining hygenic conditions will prevent the disease.

(4) **Grasserie :** The causative agent of this disease is the **nuclear polyheadrosis** virus. The affected larvae become swollen and like a bag of granules, the body fluid becomes thick and cloudy and the larvae die.

(xi) **Economic Potentialities of Cultivating Silk in Madhya Pradesh :** Madhya Pradesh is the largest state with respect to land area and has rich subtropical vegetation. Thus Madhya Pradesh holds vast economic potentialities of cultivating silk Sericulture is an important rural cottage industry. The tribal and other rural population in south east and east M.P. is favourably disposed for the cultivation of silk. Once M.P. was not a significant state in the list of silk producing states of India but due to the efforts of Madhya Pradesh Government in the direction of promoting sericulture today it, is the second largest state after Karnataka in the field of production of row silk.

(xii) **Efforts made by Government of M.P. to Promote Sericulture in state :** A directorate of silk has been organised under the Panchayat and Rural Development Department to make concentrated efforts. These activities have been divided in two categories :

(a) Kosa silk Area : It extends in the eastern and south eastern parts of the state. This area is predominated by tribal population and is spread in the districts of **Balaghat** and **Mandla**.

(b) **Mulberry silk Area :** It is spread in the western and middle parts of the state including the districts of **Indore, Dhar, Dewas, Khandwa, Ujjain, Shajapur, Raigarh, Mandsaur, Guna** and **Sehore.** For the promotion of the production of Kosa silk (now Mulberry silk) following efforts are being made.

(1) Kosa Seed Centre : Twelve Kosa seed centres have been established to provide scientific and technical information to the Kosa silk worm rearers. These centres also provide disinfected improved kosa seeds and caterpillars to the rearers.

(2) Kosa Guidance and Training Centre : Madhya Pradesh Government has established 67 centres which meet the basic needs of supplying disinfected improved seeds of Kosa silk and impart training and guidance to the rearers.

(3) **Nursery :** To meet the needs of the host plant and supply of leaves to the rearers the government has established nurseries of *Terminalia tomentosa* and *Terminalia arjuna*. Plantation of

host plants has been undertaken in 296 hectares of land and 1285 hectares of land is proposed to be covered under this scheme.

(4) The construction of two grainage, one cold storage, one cocoon market and one reeling factory is being undertaken.

(5) Kosa Regional Research centre has been established to help the rearers to increase the yield and improve the quality of silk.

(c) **Mulberry silk Plans :** To promote the mulberry silk production in M.P. certain efforts have been made in the direction by the Madhya Pradesh Government. These are

(1) **Establishment of Nursery :** To increase the production of host plant Mulberry silk worm, the Morus indica, nurseries have been established.

(2) Mulberry silk seed centres have been established.

(3) Integrated rural development projects have prepared for the production of Mulberry silk.

(4) Establishment of regional research centre and reeling factory.

(5) Demonstration and publicity plans.

Madhya Pradesh Government has allocated 476.22 lac of rupees for the development plans of silk For the year 1985-86 a target of 80,000 kg. of Kosa silk and 8356 kg. of Mulberry silk.

3.1.12 APICULTURE

Apiculture is the science of rearing honeybees for obtaining honey, **wax** and **venom**. It is a profitable money-making hobby. It forms a cottage industry, when carried out on a large scale.

Three species of honey bees are commonly found in india vig. *Apis indica* (The small indian bee). *Apis florea* (The little indian bee) and. *Apis dorsata* (the giant bee) other important species include *Apis milifera* (the common European bee) and *apis adamsoni* (the African bee) In india the commonly domesticated species are *Apis milifera* and *Apis Indica*.

(i) **Honeybee**-*Apis* : Like termites, honeybees are social insects known for producing honey and beeswax, and for living in very highly organized colonies. These feed upon nectar and pollen of flowers, possess "sucking and chewing" mouth parts, and undergo complete metamorphosis. Each colony has its own nest called **honeycomb or beehive**. The hive is thirty to ninety centimetres. It comprises thousands of small, symmetrical and hexagonal chambers, called **"cells"**, made up of beeswax. **Karl Marx** Commented that the architectural arrangement of "cells" in a beehive puts the best of human- made architecture to shame. The "cells" are used for storing honey and pollen breads, as well as, for rearing the brood.



Beehives are found upon tree branches, or hanging from ceilings of old abandoned houses, or inside caves and hollow stems of old trees.

(ii) **Division of labour and polymorphism :** Each beehive harbours a colony of thousands of polymorphic bees belonging to a single family. The polymorphic individuals are of three main types (i) a **single queen** (fertile female)(ii) one to a few hundred drones (fertile males) and (iii) **thousands (upto 60,000) of worker bees** (sterile females).

(a) **The queen :** She is the supreme being in a colony, because all the main activities in the hive revolve around her. She normally lives for about five years, and does nothing except laying eggs. That is why, she possesses immensely developed ovaries, a large abdomen, and a body which is nearly five times larger and about three times heavier than that of a worker bee. In other features, she is degenerate, having small wings and poorly developed legs, mouth parts, sting, brain, etc. She has no salivary or wax glands. Hence she can either produce honey or wax nor can she fly out of the hive. She therefore, depends for food completely upon worker bees. Although she can use her sting, but it is mainly used as an ovipositor for laying eggs. She lays about fifteen lac of eggs during her lifetime. Normally one to three thousand eggs are per day. Egg-laying is a seasonal activity occurring during winters and spring in our country.

(b) **The drones :** These are smaller, but stouter than the queen, with broader abdomen, longer appendages, and larger wings, brain and eyes. These also lack salivary and wax glands, and depend for food upon worker bees. These even lack a sting and, hence have no defense. Their sole function is to fertilize the queen. Hence, during breeding season, these are well-fed by the workers, and can be often seen flying near the hive, enjoying or chasing and mating with young queens in fight. After breeding season, in the following summer, the drones are neglected and eventually driven out of the hive to die of hunger and heat.

(c) **The workers :** These are considerably darker and smaller, and most robust with strongest mouth parts and well- developed wings. Their body is densely covered with hair like bristles. These possess four pairs of pocket-like wax- secreting glands upon ventral surface of second to fifth abdominal segments. **The wax** is chewed by means of mandibles and, then used in constructing new "cells" in the colony. The legs of worker bees are modified to collect pollen. When these bees visit flowers for sucking nectar, numerous pollen grains stick to their bristles and mouth parts. The legs are equipped with "**pollen brushes**" of stiff bristles which brush off the pollen from various parts of body and collect these in two "pollen baskets". The latter are pit like concavities upon dorsal surface of the wide tibia of hind legs (= metathoracic legs).

Due to their heavy-duty life, the worker bees live only for two to four months. Each worker bee spends its life in tireless tail. We can say that it has no childhood, because as it becomes an adult bee, it starts working for the colony from the very first day. Its functions change with age. Accordingly, the worker bees of a hive fall under age-groups or castes as follows:

(1) **Scavenger or Sanitary bees :** For the first three days, each worker bee acts as a scavenger, cleaning the wall and floors of abandoned, empty "cells" of the colony for reuse.

(2) House or Nurse bees : From the fourth day onwards, each worker bee feeds the earlier brood, like a **foster mother**, with a mixture of honey and pollen. At times, it flies out but only around the hive just to become familiar with its surroundings. From the seventh day, the maxillary glands of a worker bee begin to function. These secrete "**royal jelly**" with which the bee now starts feeding young larvae, the queen and those older larvae which are destined to develop into future queens, From the twelfth to

the eighteenth day, each worker bee develops wax glands and works upon the architecture of the hive. Wax is secreted in the form of thin scales. Middle legs scrap the scales, bring these in between the mandibles for chewing and mixing with saliva and, then, mould and use these in constructing new "cells". These bees also repair old cells, filling, cementing and varnishing cracks and crevices of these cells by means of a bee-glue called **propolis.** Propolis is prepared from resins collected by the bees from.

(iii) **Life History :** Queen lays about 2,000 eggs a day. The eggs are laid in the comb, one in each cell. They hatch out into larvae in three days. They are fed on royal jelly for a few days. But the larva which develops into the queen will be fed on royal jelly continuously.

During breeding the queen bee flies in the air along with the males. This phenomenon is called **nuptial flight.** During nuptial flight the queen copulates with a male Copulation occurs in the air. Then the bees return to the comb and the queen starts laying eggs.

(iv) **Bee-Hive :** Honey bee is one of the few domesticated insects. In modern days bee colonies are reared in artificial wooden boxes for maximum production of honey and wax. The artificial box where the bee colony is maintained and managed is called **hive**. The place where hives are kept and managed is called apiary.

There are different models of hive; but the most common model in use is Newton's hive designed

by Rev. Fr. Newton. The hive is in the form of a wooden stand. The hive has two chambers. One is the upper and the second one is the lower. The upper chamber is called **super or honey chamber**. The lower chamber is called **brood chamber**. The queen is kept in the brood chamber. The two chambers are separated by a wire grid called **queen excluder**. The holes in the queen excluder are



Life history of Apis indica

so smaller that they prevent the entry of the queen into the super, but allows other bees to pass through. As a result the eggs are laid only in the brood chamber. The super chamber is meant for storing honey.

The brood chamber is placed on a bottom board. This board extends forwards as an **alighting board** on which the bees rest for some time before entering the hive. The brood chamber has an entrance through which the bees enter. The super chamber has a **ventilator**. The super is covered ovary by a roof.

Honey mainly consist of monosaccharides

Both the chambers contain about 7 rectangular wooden frames called comb frames arranged vertically. The vertical frames are filled with **comb foundation sheet.** These sheets are made of wax and contain hexagonal imprints. They are detachable. They are available in the market.

A set of bees with a queen is introduced into a hive. They construct the comb in the vertical frames starting from the comb foundation sheets. Honey is collected in the combs of super and the eggs, larvae and the young ones are kept in the combs of brood chamber. When all the cells are filled with honey, the cells are capped or closed by a thin layer of wax.

(v) **Honey extraction :** Honey is stored in combs of super frames. It is extracted from the comb by a simple machine called **honey extractor**. It has a drum containing a rack inside to hold the super frames. It is made to rotate by a set of two-gear wheels, operated by a handle.

The super frames are removed from the hive. The caps of the comb cells are cut off by a double edged knife. Then the frames are fixed in the rack and the **rack** is made to rotate by operating the handle. The honey is forced out into the drum from the comb cells. From the drum the honey is collected in vessels through an exit present in the drum.

(vi) Location of Apiary

- The hives should be set, in places where there are plenty of flowering plants.
- They should be placed in shady places.
- The place should be neat and clean and free from any obnoxious smell.

• There should be clean drinking water near by because each bee colony requires two glasses of water per day for their survival

(vii) Protection

- Honey bees should be protected from garden lizard and snakes.
- Black ants steal honey. So water should be placed at the base of the stand.
- Wasps kill honey bees. So protection should be provided against wasps.
- Wax-moth damages the combs. So the combs must be "protected from wax-moths.

(viii) **Formation of honey :** Honey is a viscous sugary fluid formed from the nectar within the stomach of the honey bee. The bees visit flower, suck the nectar, store it in the stomach and return to the hive. In the stomach the nectar is processed. It is regurgitated and swallowed repeatedly for about 240 times. Then the processed nectar is deposited in the comb cells. This processed nectar is called **unripe honey** or **green honey**. It contains about 80% water. The unripe honey is converted into ripe honey by evaporation. This evaporation is facilitated by two methods. They are 1. The workers set up an additional circulation of air in the comb by beating their wings and 2. The worker bees carry nectar several times from one cell to another until the unripe honey becomes viscous. The ripe honey contains less than 20% water. When the honey becomes ripe, the cells are capped or closed. The honey in the unsealed cell is unripe.

(ix) **Chemical composition :** Honey contains nearly 80 different substances of importance to human beings. The important chemicals are as follows:

- It contains a large amount of glucose or fructose.
- It contains proteins as well as fats.
- The vitamins present in honey are A, B₁, B₂, B₃, B₆, *C*, *E* and *K*.

• A variety of enzymes are present in honey. They include diastase, invertase, saccharase, catalase peroxidases and lipases.

• It contains many organic acids. The most important organic acid is **formic acid**; other organic acids are malic acid, citric acid, tartaric acid and oxalic acid.

• It contains a variety of minerals like Ca, Na, K, Mg, Fe,Cl,P,S etc.

(x) Value of Honey – Honey is a valuable food and medicine. Its uses are summarised below:

(a) As it has high content of sugar it is used as a sweetener. Until last century before the discovery of sugar throughout most of human history honey was the only available sweetener.

(b) Honey has a high calorific value. One kilogram of honey has 3350 calories while 1 litre of milk contains only 310 calories.

(c) Many athletes drink honey before games and between events in order to restore the energy used up.

(d) Doctors prescribe honey for old people and children who need to build up their strength quickly.

(e) Honey contains biogenic stimulators i.e., substances that heighten the activity of organisms. It has been proved that cuttings from trees, planted after treatment in a solution of honey, take root easily and grow well.

(f) Honey is used to heal wounds.

(g) It is used to cause free urination.

(h) It is used as a means of easing the belly.

(i) It is a good tonic for ulcer.

(j) It facilitates digestion and improves appetite.

(k) It prevents a running nose. It is a sure remedy for cold and cough.

(1) Honey is used as medicines for children to treat complaints of the liver.

(m) Honey is good for kidney patients. People suffering from kidney stones are a divised to take a table spoon of honey, lemon-juice and olive oil.

(xi) **Bee wax :** Bee wax is secreted by the abdominal gland of bees. It is used for the construction of comb. It is an yellowish solid insoluble in water. It is used for the preparation of paints, varnishes, candles, models, etc. It is used as a ground substance for the preparation of ointments, creams etc. It has many industrial uses. It is used extensively in engineering industries, railways, textiles, leather industries etc.

(xii) **Bee venom :** Bee venom is secreted by the poison-glands of stings. Bee venom is a curative toxin in humans. It is transparent and it has a bitter burning taste. It is acidic in nature. It contains formic acid, histamine, tryptophan, sulphur, many proteins, volatile oils, enzymes like hyaluronidase and phospholipase and magnesium phosphate. Clinically it has the following uses :

(a) It is an active remedy for rheumatism.

(b) It is used to treat certain eye diseases like keratoconjunctivitis (inflammation of cornea), iris (inflammation of iris), iridocytis (inflammation of iris and ciliary body).

(c) It is used to cure skin diseases like tuberculosis of the skin.

(d) The cholesterol level in blood falls by the treatment of bee venom.

(e) Bee venom controls blood pressure.

(xiii) **Waggle Dance of Honeybees :** The exploitation of food sources by honeybees has been studied for decades, but its study still offers important challenges for zoologists. One of these areas of research concerns the extent to which honeybees communicate the location of food to other bees.

The communication of honeybees is remarkable because the so-called language of the bees uses a variety of stimuli to impart information about the environment. **Karl von Frisch**, famous ethologist, carried out many detailed bee experiments in the 1940 and was able to determine that when a foraging bee returns to the hive, it performs a waggle dance.

• Waggle Dance : A worker bee that returns to a hive laden with nectar and pollen stimulates other experienced workers to leave the hive and visit productive pollen and nectar sources. Inexperienced workers are also recruited to leave the hive and search for nectar and pollen, but stronger stimuli are needed to elicit their **searching behaviour**. In the darkness of the hive, the incoming bee performs what researchers have described as a round dance and a waggle dance. Throughout the dancing, other workers contact the dancing bee with their antennae and mouth parts, picking up the odours associated with pollen, nectar and other objects in the vicinity of the incoming bee's food source.

• The dance, which indicates the distance and the direction of a food source, has a figure pattern. As the bee moves between the 2 loops of the figure it buzzes noisily and shakes its entire body in so-called waggles. Distance to the food source is believed to the indicated by the number of waggles and or the amount of time taken to complete the straight run. The straight run also indicates the location of the food. Outside the hive, the dance is done on a horizontal surface and the straightaway indicates the exact direction of the food. Inside the hive, the dance is performed on the comb, which is vertical, and the angle of the straightaway to that of the direction of gravity is the same as the angle of the food source to the sun. In other words, a 40° angle to the lefts of vertical means that food is 40° to the left of the sun.

As mentioned, honeybees can use the sun as a compass because their **biological clock** allows them to compensate for the movement of the sun in the sky. In the dark hive, bees use a combination of the tactile and auditory communication. Through touch, bees can determine the direction and waggles of the dance. Not only the waggles but also the buzzing noises of the dancer tell the distance to the food source.

These observations indicate that bees communicate information regarding distance, direction and kind of food to other bees when returning from a foraging trip. Thus, the exploitation of pollen and nectar is a very efficient process and is one source of evidence of the highly evolved nature of the honeybee colony.

3.1.13 LAC CULTURE

Lac is the resinous secretion produced by lac insect as protective covering around its body. It belongs to genera *Laccifera* or *Tachardia Lacifera lacca* is the common Indian lac insect. It lives on the trees of fig family namely kikar, ber (*Zizyphus mauritiana*), babul (*Acacia nilotica*), dhak or palas (*Butea monisperma*), kusum (*schleichera oleosa*), Katha or khair (*Acacia catechu*), peepal (*Ficus religiosa*) and gular (*Ficus glomerata*).

Lac insect feeds upon the sap of its host plant like any other sap sucking insect. It is found in India and Philipine islands.

(i) **Male and female chambers :** The adult male and female insects live on the tree twigs enclosed in thick capsules or chambers separately. The male chamber are elongated and cigar- shaped.

Each male chamber has a branchial aperture in its anterior part. There is an opening in the posterior part of the chamber which is covered by an **opereculum**. The male insect can crawl out through this opening.

The female chamber is smaller and rounded. It has a branchial aperture in its anterior part and a tubercular or anal opening in the posterior part. A ridge extends in the mid-dorsal line of female chamber, which indicates the posterior end of the last larval skin.

(ii) **Male and female lac insects :** The lac insects have a sluggish and almost sedentary life, living inside the chambers. Therefore, these have become degenerated, without wings and distinct legs. However, the female is more degenerated. It has a bag -like body with a small reduced antenna. The eyes legs and wings are lost during metamorphosis. The **male lac insect** is red in colour. It has an incipient head with antennae and eyes. The thorax has three pairs of legs and abdomen carries genital sheath, **penis** and a pair of long caudal setae, one on either side of genital sheath.

The wings may be present or absent. Because of the absence of mouth parts, the insect is incapable of feeding.

(iii) Life-cycle : The male lac insect crawls out of its chamber by pushing open the operculum

reaches the female chamber and fertilizes the female through the anal or tubercular opening of female shell. The male dies soon after copulation. The female secretes more resin forming a large sized chamber. Thus the secretion by females mainly contributes to lac.

Oviposition takes place into a space inside the female chamber made by the contraction of the body of female. This space is called **incubating** chamber. Each female lays 200-300 eggs. The eggs hatch into red coloured larvae. These crawl out of the female's incubating chamber. The mass emergence of larvae is called swarming.

Each larva is boat-shaped in appearance and is about 1/2 mm in length. Its head bears paired antennae and the ocelli. The mouth parts are of



piercing and **Sucking** type with maxillae and mandibles together forming the sucking tube or proboscis. Its thorax is three segmented and each thoracic segment carries a pair of walking legs. The abdomen bears a pair of long caudal setae.

(iv) Attachment of larvae to new shoots : The larvae on emergence craw1 on the twigs of any one of the host trees mentioned earlier and settle down on the undersurface of new shoots. These prefer young succulent shoots. These force their proboscis through the bark and insert it into the phloem tissue and start feeding. Here these metamorphose into the adult insects and by secreting lac enclose themselves into the chambers.

(v) **Secretion of Lac :** The secretion forms a shining layer over their bodies in the beginning but hardens and becomes opaque later on. The secretion is produced by the cutaneous glands of the skin and is deposited around three openings the two branchial apertures at the anterior end and anal opening at the posterior end. The secretion is in the form of waxy filaments which have a woolly white appearance. On coming in contact with air, these join to from a continuous covering. Further, lac secretion continues inside this coating so that lac deposition adds to the thickness of the coating. With growth of larva and addition of lac the adjacent chambers of different larvae coalesce with one another forming a more or less continuous encrustation.

(vi) **Lac Cultivation :** In order to obtain lac, lac insects are cultured and the technique of lac production is known as the *lac culture*. It involves proper care and regular pruning of the host plants, propagation of insects, and collection and processing of lac, For the purpose of propagation the older branches containing crusts are tied with new branches and this method is called *oculation*. When new crusts are formed, the old twigs are removed (approximately 20-30 *cm* long) and this is known as *harvesting*.

After inoculation, lac insects come out of the old crusts. At this stage they are known as *nymphs*. The nymphs hatch out from eggs laid by the females in the old crusts. The coming out of nymphs from the old crusts is known as *swarming*, some of the nymphs become winged or wingless male and others become female. These nymphs explore new branches. The thousands of nymphs settle side by side, and the resinous secretion builds up around them and completely encases them. The nymphs undergo several moults. Most of them develop into females and some into males. The females remain in small cavities in the resinous mass from which they never come out.

(vii) **Extraction of Lac :** The largest yield of lac and dye are obtained by harvesting the infested twigs while females are still living. The harvesting is done twice a year in June and November. The encrused twigs are pruned and lac scrapped from them. This is known as *stick lac*. It is grounded and sieved. The resulting granular lac is called **seed lac**, and the fine particles the **dust lack**. The seed lac is washed, melted spread out in a thin layer and dried thus forming the shellac of commerce. The dust lac is used for making toys, shellac is used in the preparation of varnishes, paints and polishes; in making gramophone records and in filling ornaments like bangles and bracelets. It is used as insulating material.

Lac insects are highly useful to man. They yield lac, the utility of which discussed above. Besides this, a red dye is obtained from the body of female acts. The dye is used by women to colour the soles of the their feet, skin. Lac insects are also used for curing lung and stomach troubles.

(viii) Damages Caused to Lac Crop

(a) Lac crops is reported to be damaged by squirrels, rats, and monkeys.

(b) Certain insects also attack lac insect.

(c) **Parasites :** Eight species of chalcidoids live as parasites in the body of lac insects. These deposit their eggs into the body of insects through their anal opening.

(d) **Predators :** *Eublemma amabilis* and Holcocerea *pulverea* are the two lepdoteran predators that damage about 35% of the lac cells. Their females lay eggs on or near the encrustation. The larvae that hatch out bore through the lac deposit and feed on lac insects.

(ix) Precautions to be Taken During Lac Culture

(a) Lac intended to be used as brood should be cut at or near the swarming period, never more than one week before.

(b) Lac to be used as brood must be healthy and resistant to the parasite and predator's attack.

(c) Lac used as brood should be removed after a maximum period of 3 weeks from the date of swarming.

(d) All brood lac after use and the lac cut from the tree should be scrapped from the sticks to destroy larvae and pupae of predators of parasites.

(e) Lac should not be stored after cutting. It should be treated as soon as possible.

(f) Fumigation and water immersion immediately after cutting are also helpful in the disinfection of Lac by insects.

(x) **Economic importance of Lac :** Lac is used in the preparation of sealing wax (shellac), paints, varnish, the manufacture of photographic materials, electrical goods. Lac is also used in the preparation of bracelets, buttons, toys and in filling hollow gold ornaments. Lac is also utilized in confectionery trade and in artificial leather and pottery. Gramophone industry used to consume 30-40% of the annual production in the preparation of records.

(xi) **Cultivation of Lac in India :** India has monopoly in the production of lac. It is about 75% of the world's total output. Approximately 40 lakh ponds of lac is produced. Bihar M.P. and west Bengal are major lac producing states in India. Thailand is major competitor of India as it shares 25% of the total exports. India exports about 1,80,400 kg. of lac The use of lac is being gradually replaced by plastic.

3.1.14 POULTRY

Poultry includes the birds like chicken (hen), ducks, geese and turkey. Poultry farming deals with the rearing of them for their eggs and meat. Fowls are widely distributed as domesticated animal since time immemorial, but in the present century, it has become an important small scale industry due to modern need for palatable and nutritive food which it provides in the form of eggs as well as adult animal. An egg laying poultry bird is called hen and the poultry birds groomed for obtaining meat are called **chicken** or **broilers.** Birds specially chicken grown for meat only is known as Broiler Poultry is closely related to the problems of nutrition. Poultry and poultry products like eggs are a rich source of animal protein and a right kind of fat for good health.

India and the neighbouring countries, like Burma, Sri Lanka are the original home of the red jungle fowl (*Gallus gallus*). It seems that Aseel or Malay fowl were carried to Europe through the Middle East about 2,000 years ago and have given rise to the present-day European breeds.

(i) **Poultry farming v/s livestock rearing :** Poultry birds are easy to raise, can be acclimatised to a wide range of climatic conditions, have short life span and are prolific breeders and thus poultry farming is advantageous over livestock rearing. Moreover, poultry farming requires less space and easy to manage and maintain and brings fast returns. Hens have an average yield of 60 eggs per year, but high yielding varieties can produce more than 240 eggs in a year.

Poultry contributes about Rs. 7,500 crores to the gross national product (GNP) of India. India ranks fifth in the world's egg production. Egg is one such food commodity which cannot be adulterated. The average per capita consumption is about 32 eggs and 600 grams of poultry meat a year. At present poultry is estimated to provide employment to about seven lakh families.

(ii) **Raising of poultry** – **Fowl house :** Fowls can be reared in the hills of India without houses, but in the plains, well- ventilated and illuminated, dry houses are essential. A house of $1.8 \times 1.5 \times 1.5 \text{ m}$ has sufficient accommodation for six fowls. An open shed or verandah must be attached to this house as run to the fowls for exercise. The fowl house may be either of wood or brick and the roof is made up of corrugated iron sheets, thatch or wood. The floor is littered with chopped straw, paddy husk, dry leaves or groundnut hulls. The fowl house must be rat- proof, with proper drainage. The house and shed should be cleaned daily. Fowls of different ages are kept in separate houses. In regions with moderate climate, they are kept in cages (coops).

(a) **Feed :** The quality and balanced quantity of food material are the back-bones of poultry. The feed given to poultry birds should contain all the essential nutrients like carbohydrates, fats, proteins, minerals and vitamins. The feed usually consists of mashed cereals like bajra, wheat, maize, jowar, ragi, rice bran and oil cakes. The fish meal' prepared from the wastes of fish processing industry and meat meal' prepared from the wastes of meat processing industry is also used to feed poultry birds. The skimmed milk is highly nutritive for young chicks and should be given in clean vessels. The green food as fresh tender grass, garlic, lettuce, onions, etc. are important for poultry and should be given uncooked.

(b) Breeds of fowls : The whole poultry industry is centred round the fowls so the selection of good breed of birds for particular area is essential. The selection of fowl breed should be based on the object with which fowls are kept. Some important indigenous breeds of domestic fowl (desi hens) include Aseel, karaknath, Basara, Chittagong, Ghagus, Brahma and Cochin. Desi hens are hardy (strong) and possess natural immunity against common diseases, but they are small, slow growing, and lay small- sized and less number of eggs. The average egg production of a desi hen is about 60 eggs per annum, which is very poor. Keeping this fact in mind, a large number of poultry birds have been imported, bred and acclimatised to local conditions. Some of these are excellent egg layers while others are good meat producing birds. Some of the high egg-yielding exotic breeds of hens which have been successfully acclimatised in India include white Leghorn, Rhode Island Red, Black Minorca, Plymouth Rock, Light Sussex and New Hampshire. White Leghorn is one of the most popular egg breeds all over the world. The local varieties of hen (disi hens) have been cross bred with the highyielding varieties of exotic breeds to obtain new breeds which combine the good characteristics of both the breeds. The new improved breeds (hybrid breeds) of poultry birds grow fast, take less feed, lay more bigger-sized eggs, and are more resistant to diseases. ILS - 82, B - 77 HH - 260 are some important improved, high yielding breeds developed in India by cross breeding. The ILS-82 and B - 77 breeds lay about 200 eggs, whereas HH - 260 breeds lay more than 260 eggs per annum.

(c) **Diseases of poultry :** The poultry keeper should always be careful against the diseases. Some important diseases of poultry birds are fowl pox, ranikhet (viral), fowl cholera, salmonellosis, diarrhoea, coryza (bacterial) and aspergillosis (fungal) However, the most common disease amongst fowls is **Ranikhet disease**, caused by a virus. The disease affects the fowls of all ages. In this disease bird opens the beak, becomes thristy, suffers from fever and yellowish - white diarrhoea occurs. It is

followed by nervous symptoms like twisting of the head, circular waling and paralysis. The birds become very weak and die within two to three days. Mortality is very high about 98 to 100 per cent. But, with better management, proper housing and nutrition and timely vaccination of the chicks, the disease can be controlled very effectively.

C Ranikhet diseases is found in Hens

(iii) **Other poultry birds :** Besides domestic fowl, other birds like ducks, turkeys, etc are also raised. Ducks comprise about 6 per cent of the total poultry population in India. They are more abundant in the southern and eastern parts of India. Muscori, pekin, Aylesbury, Campbell, India Runner and Syhlet meta are some important breeds ducks. Narfold, British white, Broad Breasted Bronze and Beltsville small white are some important breeds of turkeys in India.

(iv) **Poultry development in India :** Poultry is one of the important components of the farmer's economy as it provides additional income and job opportunities to a large number of rural population in the shortest possible time. Central poultry breeding farms at Bombay, Bhubaneswar, Hessarghatta and Chandigarh engaged in scientific poultry breeding programme developed high egg producing hybrids and fast growing broiler breeds. Central Duck Breeding Farm at Hessarghatta is catering to requirements of high egg producing **khaki campbell** breeding stock duckling. The poultry industry has grown rapidly in India in the last twenty years from a backyard farming activity to a modern and highly scientific industry. As a result of government's efforts, during the seventh plan period, egg and broiler production registered a compound growth rate of 7.3 per cent and 18 per cent respectively. The egg production is estimated to be about 26.1 billion in 1994-95.

(a) Broiler or fryer – The chicken use for meat.

(b) Brooding – Living and brood out egg for incubation in particular condition.

(c) Cannibalism – Peeking of fowls among them selves.

(d) Cockerel – Young male fowl.

(e) Rooster – Mature male fowl.

3.1.15 FISHERIES

Fishes are a valuable and easily accessible source of food, rich in protein, highly nutritious and easily digestible. By the aquatic animals, they are abundantly available from sea, rivers, lakes, ponds and marshes.

Aquaculture is the production of useful aquatic plants and animals such as fishes, prawns, shrimps, lobsters, crabs, molluscs by the proper utilization of small and large bodies of water. **Pisciculture** is the production and breeding of fishes by man in ponds.

India has abundant marine and inland fish resources. It has a cost line extending to 4667 Km long and a continental shelf of 2,59,00 square Km offering good scope for fish production. The fish production has increased many folds since India got independence. During 1990-91 the annual fish production of our country has been 38.22 lakh tons. The *per capita* consumption of fish in India is estimated at 1.51 Kg/year. India is at present the 6th foremost seafood producing nations in the world.

(i) **History :** From pre-historic period, fishes have used as protein rich diet for human beings. The popularity of fishes has been mentioned in our religious books like **Ramayana** and **Mahabharata** also.

In west Bengal, Bihar and orissa, the fish industry is about 1,500 years old. In Bengal every family traditionally has atleast one pond for fishes.

Classification of cultivable fish species :

Zoological name	Common Name	Areas of availability	
(a) Fresh water fishes			
1. Catla catla	Catla	All over India common in Krishna and	
		Godavari rivers	
2. Labeo rohita	Rohu	North, East and South India	
3. Labeo calbasu	Calbasu	North and South India	
4. Cirhinus mrigala	Mrigal	North and South India	
5. Mystus singhala	Singhala	All over India	
6. <i>Heteropneustes</i>	Singhi	All over India	
fossilaris			
7. Wallago attu	Malli	North, east and South India	
8. Clarius batrachus	Fresh water shark	All over India	
	magur		
(b) Brackish water fishes			
9. Chanos chanos	Milk fish	A.P.coast	
10. Mugil cephalus	Grey mullet	East coast	
11. Laters calcorifer	Perch	East coast	
(c) Marine fishes			
12. Sardinella longiceps	Oil sardine	West and south coasts	
13. Harpodon heherius	Bombay duck	Maharastra coast	
14. Hilsa ilisha	Hilsa/ Indian shed	Coastal India	
15. Stromateus sinensis	Pomfret	Indo pacific coast	
16. Anguilla anguilla	Eel	Coastal India	
17. Aluitheronema	Salmon	East and west coast	
18. Cyano-glossus	Flat fish	East coast of India	
semifas- ciatus			

(ii) **Culture method :** The success in fish culture and the high production of table - size fish through carp culture depends largely on the designing and construction of ponds. The basic principles involved in designing and construction of carp culture ponds are of very specialized nature and vary form region to region depending upon several factors like topography, soil types, water supply etc. The requirements with regard to the designing and construction of fish farm are entirely different from those attributed to agriculture and animal husbandry farms.

(iii) **Types of Ponds :** Ponds for carp culture may be broadly classified into three types : (a) **the nursery ponds**, (b) **the rearing ponds** and (c) **the stocking ponds**. The ponds which are small and shallow are used for raising fry from spawn (4-5 mm to 25-30 mm) may be termed as <u>Nursery ponds or Nurseries</u>. Ponds used for rearing fry upto fingerling stage (50 mm and above) are known as <u>Rearing</u>

ponds. The rearing ponds are slightly larger but not proportionately deep and are used for rearing fry upto fingerling (50 mm & above) stage. While ponds which are used for stocking fry/fingerlings to obtain table-size fish may be called as stocking ponds. The stocking ponds are still larger and deeper (0.2 to 2.0 ha in size and 2 m to 2.5 m in depth).

(iv) **Species Composition and Species Densities :** Rearing of dietetically compatible species is one of the fundamental principles in fish culture. The divergent feeding habits of the Indian major carps and of the exotic Chinese carps are therefore taken advantage of in mixed culture. This divergence of feeding habits develop, as stated earlier, from advance fry stage and yet limited overlapping in feeding habits is but to be expected. In view of this, trials were made with two, three. Four and six species compositions, within which variation



in species densities or ratios were also attempted. Some of the combinations tried were as follows :

Silver carp + Grass carp	::	1:1
Catla + Rohu + mrigal	::	2:4:4
Silver carp + grass carp+ common carp	::	4:3:3
Catla + Rohu + Mrigal + common carp	::	3:4:1:2
Catla + Rohu + mrigal + Grass carp	::	8:3:1:4
Silver Carp + grass carp + common		
Carp + Rohu	::	2.4:1.2:2:2.4
Catla + Rohu + Mrigal + Silver		
Carp + Common Carp	::	2.4:4.8:1.0:2.4:2.4
(v) Types of Breeding		

(a) **Natural Breeding Habits :** Major carps are essentially river fishes. They normally do not breed in confined waters Major carps breed in rivers throughout monsoon month's i.e. June to August. Major carps exhibit local migration in monsoon months. After travelling some distance against current in flowing waters, they enter shallow marginal inundated waters, where they breed. These fishes do not exhibit any parental care. Ova are small, numerous and fertilization is external. Females lay eggs and the males sprinkle its milt over the eggs which are fertilized by inter-mixing of water, Milt or seminal fluid milky white non-sticky and non-granular. Milt consists of innumerable microscopic structures called

spermatozoa. These spermatozoa have small head. During the period of their existance, they are extremely active inhabiting a constant jerking motion.

There is sexual dimorphism in major carps. Females are generally larger than males Following factors are important which influence spawning of major carps.

- (1) Right stage maturity of fish
- (3) Extensive shallow spawning grounds
- (5) Optimum temperature
- (7) Increased pH
- (9) Mineral solution and insuspension.
- (2) Heavy monsoon floods
- (4) Current and flow of water
- (6) High dissolved oxygen
- (8) Turbidity
- (10) Instinct and physiological effect on fish.

(11) Endocrine secretion

Optimum temperature seem to be essential for breeding but major carp have known to breed over a wide range of temperature between 4^0 C - 40^0 C. Some have suggested that excessive dissolved oxygen is essential but carps have bred in water where the dissolved oxygen was actually reduced due to mixture of pollutants after the floods. pH from 7.5 to 8.3 are recorded to be suitable for spawning. Turbidity do not seem to be essential for breeding of major carps. Fish spawning induced by lightening and thunder is also doubtful. Cloudy day, however, seemed favourable for breeding of carps. Endocrine and sex stimulating hormone of pituitary gland and series of subsequent physiological changes are important for spawning

(b) **Bundh Breeding of Indian Major Carps :** Indian major carps i.e. *catla catla, Labeo rohita* and *Cirhinus mrigala* do not naturally breed in confined waters though they attain sexual maturity in these environments. Their natural breeding takes place in rivers, certain reservoirs and in artificially constructed bundh type tanks where. Favourable conditions stimulate than for spawning Bundhs breeding contribute a lot to induce breeding of major carp fish.

The history of establishment of bundhs, as a source of major carp seed production is not clear. This type of bundh breeding appears to have originated from west bengal State, especially from the districts of Midnapore and Bankura with the expansion of fish culture industry in India, the bundhs have been established in several other States namely Madhya pradesh, Bihar, Uttar Pradesh, Andhra Pradesh, Rajasthan, Haryana and Punjab. The bundhs are of two types viz., Wet **bundh** and **dry bundh**.

(1) **Dry Bundh :** A dry bundh is a shallow depression enclosed by earthen walls, (locally known as bundh) on three sides and an extensive catchment area on the fourth. Bundhs get flooded during the south-west monsoon, but remain completely dry for a considerable period during the remaining part of the year.

The topography of the land has a great role to play in the location and distribution of the dry bundhs. In bankura district of west Bengal, most of the dry bundhs, are fed with water from storage tanks, constructed in the upland area.

(2) Wet Bundh : The wet bundh is a perennial pond located on the slope of a vast catchment area of undulating terrain, with proper embankments having an inlet facing towards the upland and an outlet towards the opposite lower ends. During summer, the deeper portion of the pond retains water containing breeders. The remaining portion is dry and is used for agriculture.

(c) **Induced breeding :** One of the dependable source of quality seed supply is by inducing major carps to breed in ponds by the use of pituitary hormone injections. Pituitary extract for inducing fish to breed is used extensively in many countries. Use of fish pituitary extracts for stimulating spawning of

Indian Major carp is met with considerable success in recent years. The cost of seed production by induced breeding is very low as compared to the collection made from natural resources.

(vi) **Hormone Injection :** Major carps do not breed in ponds due to the fact that the environmental factors which are responsible for spawning in natural habitats are absent in confined waters. Sex stimulating hormones of the pituitary gland play an important role in the maturation of gonads and spawning in fishes.

The pituitary extract can be kept effectively and utilized successfully in inducing spawing of major carps through injection.

The method of injection of pituitary extract are following types.

(i) Intramuscular (ii) Intra paritonial (iii) Intracranial

(vii) Economic importance of fishes

(a) **Oils :** Fish oils are employed in leather industry for chamoising.

Fish body oils are also employed in the manufacture of candles, lubricants, cutting oils etc. Liver oil is a valuable source of vitamin A and Liver oils are of medicinal use.

(b) Fish protein : It is used for edible and industrial purposes.

(c) Fish Meal : Waste products of fish are utilized for preparing feed for poultry, pigs and Cattle.

(d) **Fish glue :** It is a product mainly of tail regions of fishes such as cod, Haddock, pollack, Hake etc.

(e) Ising glasses (It is use for Comb, Purse, Riben and forming of wine.

(f) Shark fins.

(g) Fertilizers

(h) Controller of Diseases.

(i) Scavengers.

3.1.16 PEARL CULTURE

Pearl is a concretion formed by molluscs. It consists of nacre or **mother of pearl**. It is characterised by iridescence and translucence.

Pearls is produced by the marine molluscs such as pearl oyster and mussel.

(i) Types of pearls : Pearls are of seven types. They are the following –

(a) Lingha pearl : This is the best quality pearl obtained from marine oysters.

(b) **Seed pearls :** The small pearls are called seed pearls.

(c) **Baroque pearls :** These are spherical pearls formed inside the body.

(d) **Blister pearls :** These are pearls attached to the shell. They are half-spherical in shape.

(e) **Oriental pearls :** These are true pearls with a great lustre, beauty and a smooth surface.

(f) Natural pearls : These are the pearls obtained from pearl oysters of deep oceans.

(g) **Cultured pearls :** These are the pearls obtained from cultivated species of pearl oysters.

(ii) **Composition of pearl :** The pearl is formed of **nacre.** The nacre is formed of two substances namely a **calcium carbonate** which is in the form of argonite or calcite and an albuminoid substance called **conchiolin.**

(iii) **Pearl-producing animals :** Pearls are produced by **bivalve molluscs.** There are marine as well as fresh water animals.



(iv) **Cultivable species :** Pearls are intensively produced by cultivating pearl oysters. The most important molluscs cultivated for pearls are *Pinctada vulgaris*.

(v) **Biology of pearl oysters :** Pearl oysters are sedentary animals. They are attached to rocks. They have two values. One valve is cemented to the rocks and the other free. They spawn twice in a year. The eggs are hatched into free swimming larvae. The larvae sink to the bottom of the water and develop into young oysters called spats. They grow to their maximum size in four or five years.

(vi) **Pearl formation :** The pearl oysters produce pearl as an adaptation against outside materials. When a foreign material such as a sand grain or a parasite happens to enter the body it adheres with the mantle. The mantle epithelium at once grows over the material in the form of a sac and encloses it. This mantle epithelium starts secreting concentric layers of **nacre** around the foreign material. The completed structure is called pearl.

(vii) **Culture of pearls :** The culture of pearls is a complex but sensitive process. It involves the following steps.

- (a) Collection of oysters.
- (b) Preparation of graft tissue.
- (c) Preparation of nucleus.
- (d) Implantation.
- (e) Rearing of oysters and
- (f) Harvesting



(a) **Collection of oysters :** Oysters for pearl culture are obtained by three methods. They are as follows :

(1) Pearl oysters are collected from the bottom. Of the sea.

(2) **Spats** (young oysters) are collected by placing cages in spat-falling areas of the sea.

(3) In the laboratory eggs of pearl oysters are fertilized and young once are obtained.

(b) **Preparation of graft tissue :** The piece of tissue which is inserted into the oyster is called **graft tissue** It is cut off from the mantle of another oyster. The graft must be in the form of a square of 2×2 mm in size.

(c) **Preparation of nucleus :** The nucleus is a foreign material which is inserted into the oyster. It is in the form of a of 2 mm in diameter. It is prepared from the shell of molluscs

(d) **Implantation :** The oyster is placed on a table. The foot is exposed. A small incision is made on the foot. On this incision the graft tissue is placed. The nucleus is placed on the tissue. Then the oyster is released in cages. The entire operation should be completed in 30 minutes.

(e) **Rearing of oysters :** The operated oyster are placed in cages and the cages are suspended from rafts in the sea. This type of culturing oysters is called raft culture.

(f) **Harvesting :** Pearls attain their maximum in three years. After three years, the oysters are removed from cages and the pearl is taken out. Chemically pearl is made up of $CaCO_3$ and conchiolin.

ASSIGNMENT

DOGS AND CATS

Basi	ic Level			
1.	The science of rearing, feeding, care, breeding and utilization of animals is called			is called
	(a) Animism	(b) Veterinary science	(c) Animal husbandry	(d) Dairy science
2.	The closest pets of hum	an beings are		
	(a) Elephant and sheep	(b) Dog and sheep	(c) Cattle and buffaloes	s (d) Dog and cat
3.	Earliest animal domesti	cated by primitive man w	as	
	(a) Goat	(b) Dog	(c) Horse	(d) Cat
4.	Huskies are			
	(a) Dogs		(b) Yak	
	(c) Thick furred dogs u	sed by Eskimos	(d) Nothing	
5۰	The most used domestic	cated animal by Eskimos i	is	
	(a) Cow	(b) Sheep	(c) Goat	(d) Husky
6.	Which of the following animals is used for drawing sledges, tracing criminals, guarding sh			iminals, guarding sheep,
	leading the blind			
	(a) Donkey	(b) Horse		
	(c) Dog	(d) All these functions ar	e not performed by any	single animal
7.	Sense of hearing and smell is highly developed in			
	(a) Camels	(b) Donkey	(c) Cats	(d) Cows

CATTLES AND BUFFALOES

Basic Level

The word 'livestock' includes				
(a) Sheep and goat only	(b) Pigs and camels only	(c) Cattle and buffaloes	only (d)All of the above	
Milk yield of a cow in I	India is much lower than in	n many countries due to		
(a) Inferior breeds	(b) Improper feeding	(c) Poor care	(d) All the above	
Foot- and-mouth diseas	e in cattle is caused by			
(a) Pseudomonas	(b) Salmonella	(c) Virus	(d) Anabaena	
A milch breed of cow is	S			
(a) Haryana	(b) Malvi	(c) Kankrej	(d) Sahiwal	
To increase milk yield,	cow is given			
(a) Sorbitol	(b) Stilbesterol	(c) Prolactin	(d) Ganadotrophin	
Find out breedable form	n of animal (s)			
(a) Bull	(b) Bullock	(c) Mule	(d) Both (a) and (b)	
	The word 'livestock' ind (a) Sheep and goat only Milk yield of a cow in D (a) Inferior breeds Foot- and-mouth diseas (a) Pseudomonas A milch breed of cow is (a) Haryana To increase milk yield, (a) Sorbitol Find out breedable form (a) Bull	The word 'livestock' includes (a) Sheep and goat only (b) Pigs and camels only Milk yield of a cow in India is much lower than in (a) Inferior breeds (b) Improper feeding Foot- and-mouth disease in cattle is caused by (a) Pseudomonas (b) Salmonella A milch breed of cow is (a) Haryana (b) Malvi To increase milk yield, cow is given (a) Sorbitol (b) Stilbesterol Find out breedable form of animal (s) (a) Bull (b) Bullock	The word 'livestock' includes(a) Sheep and goat only (b) Pigs and camels only (c) Cattle and buffaloesMilk yield of a cow in India is much lower than in many countries due to(a) Inferior breeds(b) Improper feeding(c) Poor care(a) Inferior breeds(b) Salmonella(c) Virus(a) Pseudomonas(b) Salmonella(c) Virus(a) Haryana(b) Malvi(c) Kankrej(a) Haryana(b) Stilbesterol(c) Prolactin(a) Sorbitol(b) Stilbesterol(c) ProlactinFind out breedable form of animal (s)(c) Mule	

14.	4. From oldtimes cattle are being used for				
	(a) Milk production(c) For production of biogas		(b) To draw water from wells		
			(d) All these purposes		
15.	The milk of which one	e of these has more fat co	ntent		
	(a) Cow	(b) Buffalo	(c) Sheep	(d) Goat	
16.	Milk yield of cattle of	India is low due to			
	(a) Inadequate food	(b) Inferior breed	(c) Both	(d) None	
17.	Which of the followin	g country is lowest in mi	lk yield per cow		
	(a) India	(b) U.K.	(c) Switzerland	(d) Netherlands	
18.	Jaffrabadi is a breed o	f			
	(a) Sheep	(b) Cattle	(c) Horse	(d) Buffalo	
19.	Roughages includes				
	(a) Cereals	(b) Millets	(c) Abundant fibres	(d) Broken grams	
20.	Ongole cattle is the ge	neral utility breed of			
	(a) Orissa	(b) Andhra Pradesh	(c) Gujarat	(d) Bihar	
21.	Which of the milk is n	utritionally superior			
	(a) Cow	(b) Camel	(c) Goat	(d) Buffalo	
22.	Milch breeds produce				
	(a) Good milk producing buffaloes		(b) Good milk producing cows		
	(c) Good working bull	locks	(d) None of these		
23.	Jaffrabad breed is dist	ributed in			
	(a) Gujarat	(b) Malvi	(c) Hallikee	(d) None of these	
24.	Buffalo is better than	cow because			
	(a) It gives more milk		(b) Its milk has more t	b) Its milk has more fat	
	(c) It is mere disease r	esistant	(d) All the above		
25.	The milk yielding cap	acity of Buffalo is			
	(a) Three times more t	than cows	(b) Double than cows		
	(c) Four times more th	nan cows	(d) None of the above		
26.	Livestock refers to				
	(a) Pet animals		(b)Poultry and pe	t animals	
	(c) Domestic animals	which are kept for use or	profit (d)None of the ab	ove	
27.	The most important live	ve stocks of India are			
	(a) Cattle and buffaloe	es (b) Cattle and dog	(c) Dog and cat	(d) Elephant and cattle	
28.	Gestation period for b	uffalo is			
	(a) 9 months	(b) 14 months	(c) 10 months	(d) 21-22 months	
29.	Foot and mouth diseas	se attacks			
	(a) Cattle	(b) Camels	(c) Sheep and goats	(d) Horses	
30.	Rinderpest is the disea	ase of			
	(a) Buffaloes	(b) Cattle	(c) Pigs	(d) Horses	

31.	Horns, hooves and bone	e can be used as			
	(a) Fertilizer	(b) Cattle feed	(c)	Both (a) and (b)	(d) Bio-gas and fuel
32.	Best source for dietary	protein for a vegetarian is			
	(a) Soy Bean	(b) Gram	(c)	Groundnut	(d) Milk
33.	Murrah, Mehsana, Jaffi	abadi are breeds of			
	(a) Buffalo	(b) Cow	(c)	Cattle	(d) Horse
34.	Nagpuri buffalo is a				
	(a) Dual purpose anima	l (b)Milker	(c)	Draught cattle	(d) All the above
35.	The best milch breed in	the world is			
	(a) Chittagong	(b) Deoni	(c)	Holstein – Feriesian	(d) Sindhi
36.	Biggest drawback of dr	aught animals is			
	(a) More consumption	of bioenergy than product	ion	(b)Short life span	
	(c) Early retirement			(d)Less reliability	
37.	The hormone injected t	o cows for excessive mill	k pro	oduction is	
	(a) Oestrogen	(b) Progesterone	(c)	Oxytocin	(d) Testosterone
38.	Cattle fed with spoilt ha	ay of sweet clover which a	cont	ains dicumarol	
	(a) Are healthier due to a good diet (b)Catch infections easily				ily
	(c) May suffer vitamin K deficiency and prolonged bleeding				
	(d) May suffer from Be	ri-Beri due to deficiency of	of B	vitamins	
39.	Which of the following	is an exotic breed of cow	,		
	(a) Deoni	(b) Holstein	(c)	Hallikar	(d) Tharparkar
40.	Which of the following	breed of buffaloes is mos	stly o	demanded	
	(a) Surti	(b) Murrah	(c)	Jaffrabadi	(d) Bhadawari
41.	On the basis of utility, I	Nagpuri buffaloes are cate	egori	ised as	
	(a) Milkers	(b) Draught cattle	(c)	Dual purpose	(d) Grazers
42.	General utility breeds a	re			
	(a) Gir, Sahiwal and De	eoni	(b)	Malvi, Nageri and H	Halliker
	(c) Haryana, Ongole an	d Kankreg	(d)	Tharparker, Kangay	an
43 .	The milch breed of catt	le are			
	(a) Hillikar, Nageri and	Malvi	(b)	Gir, Sahiwal and De	eoni
	(c) Kankrej, Haryana a	nd Ongole	(d)	Tharpaker, Kangaya	in
44.	The number of calves p	roduced during its whole	repr	oductive period of a	cow or buffalo is
	(a) 8 – 10 calves	(b) 15 – 20 Calves	(c)	12 – 16 Calves	(d) $5-7$ calves
45 .	The most important live	estock species in India is			
	(a) Capra indica	(b) Bos indica	(c)	Bos bubalis	(d) Capra ovis
46.	Viral diseases of anima	ls include			
	(a) Cephalitis, blue ton	gue, foot and mouth diseas	se		
	(b)Blue tongue, foot an	d mouth disease, rinderpe	st, r	abbies	
	(c) Blue tongue, rinder	pest, cephalitis, rabbies	(d)	None of these	

47.	Zebu cattle is				
	(a) Water Buffalo	(b) Indian Buffalo	(c) Cow	(d) Sheep	
48.	Most of female buffalo	es show sign of heat in the	2		
	(a) Morning	(b) Afternoon	(c) Evening	(d) Night	
49.	Cows and buffaloes ren	nain in heat for			
	(a) 24 – 36 hours	(b) 24 – 36 days	(c) 7 – 10 days	(d) 15 – 20 days	
50.	Murrah is a breed of				
	(a) Goats	(b) Buffaloes	(c) Cows	(d) Sheep	
51.	Number of breeds of Z	ebu Cattle is			
	(a) 16	(b) 26	(c) 6	(d) 13	
52.	Number of breeds of In	idian Buffalo is			
	(a) 7	(b) 13	(c) 16	(d) 17	
53.	Nali Ravi is a				
	(a) Buffalo	(b) Cow	(c) Pig	(d) Sheep	
54.	Which breed of Buffalo	pes is most popular			
	(a) Marrah	(b) Bhadawari	(c) Jaffrabadi	(d) Surti	
55.	Indian best cattle breed	s are found in			
	(a) Coastal area	(b) Hilly region	(c) Plains of rivers	(d) Drier parts	
56.	Sunandini is				
	(a) A famous dancer from	om Kerala			
	(b) Name of a marine f	ish found at coasts of Tam	il Nadu		
	(c) A cow formed by h	ybridization of Indian bree	ed and Jersey cow		
	(d) None of the above				
57.	Gelatin, a very importa	nt raw material for prepara	ation of photographic en	nulsion, is a bi-product of	
	(a) Chicken	(b) Forest	(c) Fish	(d) Cattle	
58.	Assertion (A) : Cattle	breed can be improved by	superovulation and emb	ryo transplantation	
	Reason (R) : Superovu	ilation in high milk yieldir	ng cows is induced by ho	ormonal injection	
	(a) If both assertion and	d reason are true and the re	eason is the correct expla	anation of the assertion	
	(b) If both assertion a	nd reason are true but th	he reason is not the co	prrect explanation of the	
	assertion				
	(c) If assertion is true statement but reason is false				

(d) If both assertion and reason are false

SHEEP AND GOATS

Basi	ic Level			
59.	Which of the following	g is known as poor man's c	ow and was associated v	with Gandhiji
	(a) Goat	(b) Sheep	(c) Desi cow	(d) Buffalo
60.	Important occupation of	of the people living in temp	perate- Himalayan region	n is
	(a) Sheep rearing	(b) Goat rearing	(c) Sericulture	(d) Apiary
61.	Lohi is			
	(a) A breed of sheep		(b) A breed of goat	
	(c) A breed of Domesti	c Fowl	(d) A breed of Geese	
62.	Sheep and goats differ	in their		
	(a) Habit		(b) Habitat	
	(c) Size		(d) Body shape, horn si	ize and nose shape
63.	Flesh of Goat is			
	(a) Pork	(b) Meat	(c) Mutton	(d) Beef
64.	Bhakarwal breed of she	eep is distributed in		
	(a) Gujarat	(b) Maharashtra	(c) Rajasthan	(d) Jammu and Kashmir
65.	Goats feed on			
	(a) Low herbs	(b) Grass		
	(c) Low shrubs	(d) Shrubs and low trees		
66.	Sheep are reared mainly	y for		
	(a) Meat	(b) Mutton	(c) Wool	(d) Milk
67.	Sheep is sheared from			
	(a) May to December	(b) August to September	(c) April to October	(d) Whole of the year
68.	The richest sources of	vitamin B12 are		
	(a) Rice and hen's egg		(b) Carrot and chicken'	s breast
	(c) Goats liver and spir	ulina	(d) Chocolate and gree	n gram
69.	The breeds of sheep wh	nich give good quality woo	ol are	
	(a) Lohi and Nellore	(b) Rampur and Deccini	(c) Nellore and Deccin	i (d) Nali and Lohi
7 0 .	Gaddi breed of goat is	distributed in		
	(a) Punjab	(b) Rajasthan	(c) Himachal Pradesh	(d) Kerala
71.	Kashmiri Pashmina is a	a native breed of		
	(a) Sheep	(b) Goats	(c) Buffaloes	(d) Cattle
72.	Which of the following	g is an exotic breed of shee	p	
	(a) Nali	(b) Lohi	(c) Merino	(d) Bhakarwal
73.	Famous angoora wool	IS got from a	(a) C ast	(d) Val
	(a) Sneep	(D) Kabbit	(C) Goat	(d) Yak
74.	wool – the shahtoosh	mai is source of the worl	a s mest, ngntest, wari	mest and most expensive
	(a) Chiru	(b) Nilgai	(c) Cheetal	(d) Kashmiri goat

75.	The feet with two toes forming cloven hoof is seen in				
	(a) Horse	(b) Elephant	(c) Sheep	(d) Zebra	
		<u>PI</u>	<u>GS</u>		
Basi	ic Level				
76.	Which one of the far within a span of six mo	ming requires less space, onths	easier to manage and	maintain and fast return	
	(a) Poultry	(b) Fishery	(c) Sericulture	(d) Pig farming	
77.	Which animal can eat	vegetables, garbage, kitche	en waste and human exci	reta	
	(a) Dog	(b) Pig	(c) Ass	(d) Chicks	
78.	Which one of the anim	al having well-defined bre	eding seasons, from Nov	vember to March	
	(a) Camel	(b) Pig	(c) Mule	(d) Donkey	
79 .	Farming of which one	of these has definite advar	ntage over others		
	(a) Pig farming	(b) Poultry farming	(c) Cattle farming	(d) Sheep- farming	
80.	Landrance is a breed of	f			
	(a) Horse	(b) Pig	(c) Camel	(d) Donkey	
81.	Ghori is a breed of				
	(a) Cow	(b) Horse	(c) Pig	(d) Camel	
82.	The most economical '	'meat making machines" t	hat nature has ever produ	uced is	
	(a) Goat	(b) Broilers	(c) Pig	(d) Buffalo	

HORSES, DONKEYS AND MULES

Basic Level

83.	There are two breeds of donkeys in India. These are small gray and large white. The large white			
	is also called wild ass w	which occurs in		
	(a) Rajasthan	(b) Bihar	(c) Assam	(d) Rann of Kutch
84.	Spiti is a breed of			
	(a) Horse	(b) Camel	(c) Buffalo	(d) Cow
85.	The varieties of Indian	donkey are		
	(a) Only one	(b) Two	(c) Several	(d) No Indian variety
86.	The animal which is us	ed by Indian army in mou	ntain terrains	
	(a) Horse	(b) Mule	(c) Donkey	(d) Camel
87.	The animal most useful	on difficult terrains is		
	(a) Mule	(b) Yak	(c) Camel	(d) Elephant
88.	Most important factor tropical countries, is	to be taken into considera	ation while constructing	pig horse particularly in
	(a) Sun light	(b) Air	(c) Humidity	(d) Temperature
89.	Which of the following	is a beast of burden		
	(a) Donkey	(b) Mule	(c) Horse	(d) All of these

90.	Bhutia is a breed of				
	(a) Chicken	(b) Goat	(c) Sheep	(d) Horse	
91.	Horses are considered				
	(a) Beasts of burden	(b) Tough animals	(c) Intelligent animals	(d) All of these	
92.	Compare to other anim	al which one has low repr	roductive rate		
	(a) Camelus dromidaru	us (b)Ovis sp	(c) Capra hircus	(d) Horse	
93.	Horses are fed on				
	(a) Dry fodder only	(b) Oats, barley, gram an	nd hay		
	(c) Grass only	(d) Roughage and concer	ntrates		
94.	Spiti breed of horse is t	found in			
	(a) Ladakh	(b) Himachal Pradesh	(c) Rajasthan	(d) Gujarat	
95.	A beast of burden which	ch needs little care is			
	(a) Pig	(b) Donkey	(c) Mule	(d) Yak	
96.	Hinny is a hybrid of male				
	(a) Horse and female donkey		(b) Donkey and female horse		
	(c) Goat and female lan	mb	(d) Sheep and female goat		
		CAME			
Rasi	ic I ovol				
Dusi 07	The camel hump size i	s a good indicator of its			
97.	(a) Storage water	s a good maleator of his	(h) Remarkable desert	adaptation	
	(c) Nourishment		(d) None of these	adaptation	
<u> </u>	Indian camel is charact	arised by	(u) None of these		
90.	(a) 3 humps	(b) 2 humps			
	(a) 1 humps	(d) Variable number of 1			
	(c) I numps	(u) variable number of i	numps		
99.	Camers breed in			(1) NI: - 1-4	
	(a) Summer	(b) winter	(c) Rainy season	(d) Night	
100.	Which of the following	g is popularly called 'ship	of the desert		
	(a) Yak	(b) Camel	(c) Donkey	(d) Horse	
101.	Water is regularly supp	olied from the oxidation of	t tood present in the		
	(a) Liver	(b) Stomach	(c) Hump	(d) Intestine	
102.	The most valuable anir	nal in desert is			

(c) Elephant

(c) Four

(a) Yak
(b) Wilk ass
103. Number of breeds of Indian Camels
(a) Two
(b) Three

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(d) Camel

(d) Five

104.	Long neck of camel is	due to			
	(a) Number of neck vertebrae				
	(b) Length of each necl	k vertebrae			
	(c) Development of ext	tra bony plates between su	accessive neck vertebrae		
	(d) Development of mu	scular pads between succ	essive neck vertebrae		
105.	The camel's hump is co	omposed of a – tissue, whi	ich provides water when	it is oxidised	
	(a) Skeletal	(b) Muscular	(c) Areolar	(d) Adipose	
106.	6. There are tow kinds of camel. Arabian and Bactrian. The Arabian camel have				
	(a) One hump	(b) Two hump	(c) Three humps	(d) None of these	
107.	The Bactrian camels po	ossess			
	(a) Two humps humps	(b) One hump	(c) Four humps	(d) Variable number of	
108.	A disease infecting car	nel is			
	(a) Pullorum	(b) Surra	(c) Rinderpest	(d) Encephalomalacia	
109.	9. Indian breeds of Camels are				
	(a) Jaisalmeri	(b) Sindhi	(c) Bikaneri and Kutch	i (d)All the above	
110.	Bactrian Camel is char	acterised by			
	(a) Two humps and lor	ng neck	(b) Two humps and lor	ng limbs	
	(c) Two humps and thi	ck coat	(d) Single hump and th	ick coat	
		ELEPH	ANT		
Basi	ic Level				
111.	The largest land anima	l is			
	(a) Camel	(b) Elephant	(c) Rhino	(d) Python	
112.	Elephants have very po	oor			
	(a) Sense of hearing	(b) Sense of smell	(c) Sight	(d) Sense of taste	
113.	Gestation period of ele	phants is			
	(a) 10 months	(b) 15 months	(c) 21 –22 months	(d) 25 months	
114.	There are two types of	elephants, African and In	dian. African elephants h	nave	
	(a) Larger ears	(b) Convex sloping forel	head (c)Tusks in both set	tes (d)All the above	
115.	Elephants are sought at	fter for			
	(a) Skin	(b) Hair	(c) Meat	(d) Ivory	

Basi	ic Level			
116.	Yak is very useful in			
	(a) Grass lands	(b) Marshy lands	(c) Mountain terrain	(d) In all places
117.	Yak transports			
	(a) Goods	(b) People	(c) People and goods	(d) None of these
118.	Yak is found in			
	(a) Tibet	(b) Ladakh, Lahaul and S	Spiti	
	(c)Garhwal and Sikkin	n (d)All the above		
119.	Yak gives			
	(a) Meat	(b) Hide	(c) Wool	(d) All of these
120.	Domesticated livestoch	c of high mountains is		
	(a) Yak	(b) Goat	(c) Sheep	(d) Horse
		ANIMAL BR	EEDING	
Basi	ic Level			
121.	Super-ovulation and en	nbryo transplantation are	meant for improving	
1				

	1		1 0		
	(a) Human race	(b) Livestock	(c) Poultry	(d) Plants	
122.	Name of sheep cloned	for the first time is			
	(a) Dolly	(b) Polly	(c) Molly	(d) Holly	
123.	First artificial insemina	tion was done in India at			
	(a) National Dairy Insti	tute, Karnal (Haryana)			
	(b) Indian Veterinary R	esearch Institute, Izatnaga	ur (U.P.)		
	(c) Punjab Agricultural University, Ludhiana (Punjab)				
	(d) Allahabad Agricultural Institute, Allahabad (U.P.)				
124.	24. Artificial breeding of cattle is brought about by				
	(a) Artificial inseminat	ion	(b)Superovulation and	embryo transplantation	
	(c) Homozygotic twinn	ing	(d) All the above		
125.	Llamas and Alpacas are	e			
	(a) Breeds of buffaloes	(b) Breeds of Horses	(c) Breeds of Camels	(d) Breeds of Sheeps	
126.	Scientific method of br	eeding includes			
	(a) Super ovulation onl	У	(b)Artificial inseminati	on only	
	(c) Embryo transplantat	ion only	(d) All of the above		
127.	A science dealing with	the improvement of dome	esticated animals is know	n as	
	(a) Veterinary science	(b) Genetic engineering	(c) Animal husbandry	(d) Animal science	
128.	High milk yielding var	ieties of cows are obtained	l by		
	(a) Artificial inseminat	ion	(b)Superovulation		
	(c) Use of surrogate mo	others	(d) All of these		

120	• It is now possible to breed plants and animals with desired characters through			
129.	(a) Ikehana technique		(b) Tissue culture	
	(c) Genetic engineering		(d) Chromosome engineering	
120	(c) Senere engineering		improving	
130.	(a) Quality of milk brow	eds of cows	(b) Breeds of sheep	mproving
	(a) Quanty of mink of c		(d) All of these	
	(c) Dieeus of goals	mustion is used for	(d) All of these	
131.	(a) Preservation of various tissues (b) Preservation of semen of good quality but			an of good quality bulls
	(a) Preservation of vari	ous ussues	(d) All of the above	ien of good quanty buils
	(c) Preservation of very	y young lociuses	(d) All of the above	
132.	Selective breeding, pro	(b) Duffele	(a) Sheer	(d) Annual food arong
	(a) Calle Evotio broads are	(D) Bullalo	(c) Sneep	(d) Annual lood crops
133.	(a) Used for cross bree	dina	(b) Allowed to multiply	y and replace local breeds
	(a) Used for cross bree	unig	(d) Resistant to local n	ests and nathogens
124	Drought breeds produc	e	(d) Resistant to focal p	ests and pathogens
134.	(a) Good milk produci	e 19 cows	(b) Good working bullocks	
	(c) Both (a) and (b)		(d) None of these	
135.	By deep freezing, it is	possible to preserve foetus	8	
	(a) 1- day old	(b) 2- day old	(c) 3- day old	(d) 1- week old
136.	One week old embryo	can be preserved at	•	
	(a) $-196^{\circ}C$	(b) $-200^{\circ}C$	(c) -270° <i>C</i>	(d) None of these
137.	The ova are released l	by hormone induction and	d fertilization by artifici	al insemination and then
	embryo is stored at 4°C	C for several years. This is	the technique known as	
	(a) Artificial inseminat	ion (b)Embryo transplant	tation	
	(c) Super ovulation	(d)Preservation of en	nbryo	
138.	Which of the following	g has been recently used for	or increasing productivity	y of super milch cow
	(a) Artificial inseminat	ion by a pedigreed bull or	hly	
	(b) Superovulation of a	high production cow only	У	
	(c) Embryo transplanta	tion only	·····	(
	(d) A combination of 'carrier cow' (surrogate	mother)	insemination and embr	yo transplantation into a
139.	Cryopreservation is			
	(a) Preservation of livin	ng being in chemicals	(b) Preservation at ver	y low temperature
	(c) Preservation throug	h expoure to irradiation	(d) Preservation throug	th use of gases
140.	Which amongst the fol	lowing is used in raising s	uper milk cows	
	(a) Artificial inseminat	ion with pedigree bull	(b) Embryo transplanta	tion
	(c) Superovulation of h	ligh yielding cow	(d) All the above	

141.	Mule is			
	(a) Fertile	(b) Sterile		
	(c) Fertile after age	(d) Sterile after some age	9	
142.	Lactation in sterile cow	vs is induced by		
	(a) Vitamin B_{12}	(b) Stibesterol	(c) Gonadotropin	(d) None of these
143.	Surrogate mother is			
	(a) Mother without lact	tation (b)Future mother	r with embryo implanted	d from another
	(c) Carrying several en	nbryos (d)Artificially ins	seminated female	
144.	Random and controlled	l breeding are included in	the	
	(a) Scientific method o	f breeding	(b)Natural method of	breeding
	(c) Both (a) and (b)		(d) Cultural method of	fbreeding
145.	The sperms employed t	for artificial insemination	of cattle are stored in	
	(a) Liquid oxygen	(b) Dry ice	(c) Liquid ammonia	(d) Liquid nitrogen
146.	The branch of biology	y dealing with the proce	ss of improvement of	human race by selective
	breeding is called			
	(a) Euthenics	(b) Eugenics	(c) Euphenics	(d) Obstetrics
147.	The transgenic animals	are those which have		
	(a) Foreign DNA in some of its cells (b) Foreign DNA in all its cells		l its cells	
(c) Foreign DNA and RNA in some of its cells (d) Foreign		(d) Foreign DNA and	RNA in all its cells	
		SERICUL	TURE	
Basi	ic Level		<u></u>	
148.	Which o the following	is not a plant product		
	(a) Hemp	(b) Silk	(c) Cotton	(d) Flax
149.	Silk industry is related	to		
	(a) Sericulture	(b) Apiculture	(c) Pisciculture	(d) Horticulature
150.	Silkworm is a			
	(a) Beetle	(b) Worm	(c) Fly	(d) Moth
151.	Which is a product of i	nsect body		
	(a) Honey, wax and sill	k (b)Silk, lac and wax	(c) Royal jelly, wax an	nd lac(d)All the above
152.	Sericulture is done on l	arge scale in		
	(a) China, Japan, Brazi	1	(b)Italy, France, Russi	a
	(c) Spain, India, Repub	lic of Korea	(d)All the above	
153.	The biggest centre for t	the production of raw silk	in India is	
	(a) Jammu and Kashmi	r(b) Karnataka	(c) Assam	(d) Tamil Nadu
154.	Maximum production of	of raw silk is in		

(c) China

(c) India

(a) India

(a) Japan

155. 'Sericulture' is native of

(b) Russia

(b) China

(d) Italy

(d) Korea

156.	Mulberry, munga, oak	and tusser all the four var	ieties of silk are present	in a single country. The
	country is			
	(a) China	(b) India	(c) Japan	(d) Korea
157.	SIIK IS a	(\mathbf{h}) I : \mathbf{h} : \mathbf{h}	(a) Dratain	(d) Name of these
0	(a) Carbonydrate	(D) Lipid	(c) Protein	(d) None of these
158.	(a) Mulberry fruite	(h) Mulharry laguag	(a) Dor looved	(d) Castor laguas
150	(a) Mulderry fruits	Common silk work is or	(C) Bel leaves Silk is obtained from	(u) Castor leaves
159.	(a) Antheraea mylitra	(b) Rombyx mori	(c) Antheraea Royalae	(d) Antheraea
	assamensis		(c) i intriciacia i toganac	(a) i maiorada
160.	Silk, honey and lac are			
	(a) Secretory substance	of insects	(b) Secretory substance	of plants
	(c) Artificial chemicals		(d) All of the above	
161.	The insect that is not fo	ound in the wild state is		
	(a) Lac insect	(b) Cochineal insect	(c) Honey bee	(d) Silk moth
162.	Palas and Ber produce a	a paticular type of lac which	ch is known as	
	(a) Khair lac	(b) Kusum lac	(c) Neelam lac	(d) None of the above
163.	Original home of Bomb	yx mori was		
	(a) Japan	(b) China	(c) India	(d) Korea
164.	Commercial silk is obta	ined from		
	(a) Cocoon/pupa moth	(b) Caterpillar	(c) Adult moth	(d) Both egg and adult
165	Which of the following	species of silk worm are t	found in India	
105.	(a) Rombyr mori	(b) Anthera nanhia	(c) Anthera assama	(d) All the above
166	This one is a viral disea	(b) milliora papila	(c) 7 intricit dissuind	(d) i fin the above
100.	(a) Crasserte	(b) Magget diagona	(a) Mussordina	(d) Dobring diagon
	(a) Orasserte	(b) Maggot ulsease	(c) wiuscardine	(u) rebille uisease
167.			()) '	
	(a) Potassium	(b) Phosphorus	(c) Nitrogen	(d) Mangesium
168.	In Silkworm, if juvenile	e hormone is absent at the	time of larval moulting,	the worm will
	(a) Die	(b) Moult into larva stage	e (c)Moult into pupa	(d) Moult into adult
169.	The larva starts pourin saliva comes out in air,	g out its sticky saliva th the liquid saliva changes i	rough minute aperture, into a fine	called spinneret, As the
	(a) Structure	(b) Substance	(c) Silk thread	(d) Tube
170.	Pebrine is a severe here	ditary disease. It is caused	l by parasited protozoans	5
	(a) Entamoeba histolyti	ca (b)Monocystis	(c) Nosema bombycis	(d) Trypanosoma
171.	Rearing of which specie	es is not possible commer	cially in laboratories or	in mud houses
	(a) Antheraea mylitra	(b) Antheraea assamensi.	s (c)Antheraea royala	<i>ue</i> (d)All of the above
	-		-	

172.	. The silk fibres are held together in cocoon by a substance known as			
	(a) Sericin	(b) Cement	(c) Glue	(d) None of these
173.	The life cycle of mulbe	erry silk worm is complete	ed	
	(a) 20 days	(b) 30 days	(c) 35 days	(d) 45 days
174.	India's rank in the worl	d in production of mulber	ry silk is	
	(a) First	(b) Second	(c) Third	(d) Fourth
175.	Silk is produced by			
	(a) Larva	(b) Adult moth	(c) Both (a) and (b)	(d) Cocoon/Pupa
176.	Silk is a product of			
	(a) Cuticle of larva		(b) Cuticle of adult	
	(c) Salivary gland of la	rva	(d) Salivary gland of a	adult
177.	Silkworm larva spins s	ilk from		
	(a) Inside to outside	(b) Outside to inside		
	(c) Random fashion	(d) Anterior to posterior	side	
178.	About 454gm of silk is	obtained from about		
	(a) 21,000 cocoons	(b) 22,000 cocoons	(c) 24,000 cocoons	(d) 25,000 cocoons
179.	The larva of silk moth	is		
	(a) Tadpole	(b) Maggor	(c) Caterpillar	(d) Miracidium
180.	Each cocoon of silk me	oth has about		
	(a) 800 metres of silk t	hread	(b) 900 metres of silk t	thread
	(c) 1000 metres of silk	thread	(d) 1500 metres of sill	k thread
181.	Bombyx mori lives on a	mulbery leaves in India. It	ts life span is	
	(a) 1 – 2 days	(b) 3-4 days	(c) 3.5-6 days	(d) 8-10 days
182.	Pebrine is a disease of			
	(a) Honey bee	(b) Fish	(c) Silkworm	(d) Lac insect
183.	Which one of the follo	wing is the source of silk		
	(a) Eggs	(b) Caterpillar	(c) Cocoon	(d) Pupa
184.	Secretion of silk gland	comes through a small po	ore. This pore is situated	on
	(a) Exopodite of 2 nd ma	axilla	(b) Endopodite of 1 st n	naxilla
	(c) Prostheca of mandi	ble	(d) Anterior part of hy	popharynx
185.	In an egg laying of 'Bo	mbyx mori', the number of	f eggs are	
	(a) 200 to 300	(b) 300 to 500	(c) 400 to 600	(d) 500 to 700
186.	which set is of benific:	at apphinged insect	(b) C:11,	
	(a) Honey bee, lac inse	cci, cocnineal insect	(d) Sand fly hutterfl-	bee, wasp
	(c) noney bee, slik wo	ini, cockroach	(u) Sand Hy, butterfly	, noney bee

187.	37. Total world raw silk production in 1990-91 was				
	(a) 72879 tons	(b) 72879 quintals	(c) 728790 tons	(d) 728790 quintals	
188.	Silk contains a pr	otein known as			
	(a) Fibroin	(b) Casein	(c) Sericin	(d) Both (a) and (b)	
189.	Which one is the	best silk			
	(a) Eri silk	(b) Mulberry silk	(c) Tassar silk	(d) None of these	
190.	Total silk product	tion in India in 1990-91 wa	as		
	(a) 12665 tons	(b) 126650 tons	(c) 12665 quintals	(d) 126650 quintals	
191.	Eggs of silk worr	n are kept in cold storage a	nt		
	(a) 5° <i>C</i>	(b) 2° <i>C</i>	(c) 2- $5^{\circ}C$	(d) $3^{\circ}C$	
192.	Choose the correct	ct insect, type of silk and p	lant combination from a	mong the following	
	(a) Antherea roylae, Eri, Peltoforum (b) Bombyx mori, fine silk and Mulberry			fine silk and Mulberry	
	(c) Antherea royl	ae, Tasar, Mulberry	(d) Bombyx mori	, Tasar, Terminalia	
193.	93. Match the following using the codes given below				
	1. Pure silk	A. Samia Cynthia			
	2. TasarB. Antharea assamensis				
	3. Muga C. Bombyx mori				
	4. Eri	D. Anthareae paphi	ia		
	(a) $1 - C$, $2 - D$, 2	3 – B, 4 - A	(b) $1 - A$, $2 - B$, 3	3 - C, 4 - D	
	(c) $1 - D, 2 - C, 3$	3 – B, 4 - A	(d) $1 - C, 2 - D, 2$	3 – A, 4 - B	
194.	The maximum le	ngth of silken fibre which	surrounds the single coco	oon is about	
	(a) 8000 – 12000	feet (b) $1000 - 15000$ m	neter (c) 800 to 1200 fe	et (d) 8000 to 12000 meter	
195.	Tubular elongate	d early pupa of silk worm i	is known as		
	(a) Imago	(b) Early imago	(c) Chrysalis	(d) Early chrysalis	
196.	Match the names answer which giv	given under Column – I $\frac{1}{2}$	with their relations gives of the alphabets of the t	n under column II, choose the	
	6	Name	Relations		
		A. Bombyx mori	P – Disease of mu	lberry	
		B. Morus alba	\mathbf{q} –Centre where silkw	vorm	
			egg are produced a	ind	
			supplied		
		C. Grainage	r – Silk moth		
		D. Powdery mildew	s – Mulberry plant		
			t – Freshly hatched		
		~ ~ ~	silkworm		
	(a) $A = q, B =$	r, C = s, D = t (b)A = r, l	B = s, C = q, D = p		

(a)A = q, B = r, C = s, D = t (b)A = r, B = s, C = q, D = p(c)A = r, B = q, C = t, D = s (d) A = s, B = r, C = q, D = t

APICULTURE

Basi	c Level				
197.	Rearing of bees is				
	(a) Horticulture	(b) Apiary	(c) Apiculture	(d)	Poultry
198.	Honey is collected by				
	(a) Wasp	(b) Housefly	(c) Butterfly	(d)	Bee
199.	Worker Bees are				
	(a) Fertile males	(b) Fertile females	(c) Sterile females	(d)	Sterile males
200.	Mouth parts of honey b	bee are			
	(a) Biting and chewing	type	(b) Piercing and sucking	g typ	pe
	(c) Chewing and lappin	ng type	(d) Sponging type		
201.	o1. The worker arises from a fertilized egg and if its larva is fed on				
	(a) Pollen	(b) Honey	(c) Mucus	(d)	Royal Jelly
202.	Drones are				
	(a) Sterile males	(b) Fertile males	(c) Sterile females	(d)	Fertile females
203.	The science of bee keep	ping is known as			
	(a) Sericulture	(b) Apiculture	(c) Pisciculture	(d)	Horticulture
204.	'Apis' is a generic name	e of			
	(a) A fish	(b) Lac insect	(c) Honey bee	(d)	Prawn
205.	In honey bee royal jelly	is secreted from			
	(a) Corp gland	(b) Wax gland	(c) Pharyngeal gland	(d)	Salivary gland
206.	Sting apparatus in hone	ey bee is a modified form of	of		
	(a) Ovipositor	(b) Wax glands	(c) Alkaline glands	(d)	Podical valves
207.	Unfertilized egg develo	ops into			
	(a) Worker	(b) Drone	(c) Soldier	(d)	Queen
208.	Which of the following	animal can be formed wit	thout fertilization		
	(a) Human	(b) Hen	(c) Honey bee	(d)	Ascaris
209.	Among honey bees, wo	orkers are		_	/
	(a) Male	(b) Female	(c) Male and female bo	th	(d) Hermaphrodite
210.	Queen is specified for				
	(a) Administration	(b) Making hive	(c) Egg laying	(d)	Collection of food
211.	In which the parthenog	enesis is observed		(1)	
	(a) Honey bee	(b) Silk work	(c) Earth worm	(d)	House fly
212.	The benefits of honey t	bees are			
	(a) Honey and pollinati	on of flowers only	(b) Honey and wax only	ý 11.	
	(c) Wax and pollination	n of flowers only	(a) Honey, wax and po	IIIna	ation of flowers
213.	Number of queens in a	nive 1s (b) 15	(a) 20	(1)	1
	(a) 10	(0) 15	(c) 20	(a)	1

214.	. The fertile female honey bee is called				
	(a) Drone	(b) Worker	(c) Queen	(d)	King
215.	What is the main nutrit	ive element in honey			
	(a) Disaccharide sugar	(b) Enzymes	(c) Vitamins	(d)	All the above
216.	Bee-keeping has been i	included under			
	(a) Khadi and village in	ndustries corporation	(b) Khadi and silk indu	strie	s corporation
	(c) Apiculture industrie	28	(d) None of these		
217.	The sugar present in ho	oney is			
	(a) Glucose	(b) Maltose	(c) Lactose	(d)	Fructose
218.	The wax glands in hone	ey bee are present			
	(a) On the ventral side	of the last segment			
	(b) On the ventral side	of last four abdominal seg	ments		
	(c) On the dorso –latera	al side of first two abdomi	nal segments		
	(d) On the lateral side	of last two abdominal seg	ments		
219.	Honey has a high conte	ent of			
	(a) Levulose	(b) Glucose	(c) Sucrose	(d)	Fructose
220.	Intraspecific communic	cation between ants is don-	e by		
	(a) Pheromones	(b) Thuricide	(c) Octodecenoic acid	(d)	None of these
221.	Which is not a social in	isect			
	(a) Ant	(b) Honey bee	(c) Termite	(d)	Digger - wasp
222.	Where from you get ca	ntheridine			
	(a) Apis	(b) Blister beetle	(c) Lepisma	(d)	Culex
223.	Which among the follo	wing is real product of Ho	oney bee		
	(a) Honey	(b) Pollen	(c) Bee wax	(d)	Propolis
224.	The queen arises from	a fertilized egg and of its l	arva especially fed on		
	(a) Honey	(b) Pollen	(c) Royal jelly	(d)	Micro organisms
225.	Nuptial flight means				
	(a) Mating in hive	(b) Mating on flowers			
	(c) Mating in mid air	(d) Mating in hive and f	lowers		
226.	Important species of ho	oney bees are			
	(a) 2	(b) 3	(c) 4	(d)	5
227.	The drone develops fro	om an unfertilized egg if its	s larva is fed upon increa	ising	proportions of
	(a) Royal jelly	(b) Honey	(c) Mucus	(d)	Pollen
228.	The caste that develops	s by parthenogenesis in ho	neybee is		
	(a) Queen	(b) Drones	(c) Workers	(d)	None of these

229.	Royal jelly is composed	d of			
	(a) Pollen			(b) Honey	
	(c) Digested honey and	l pollen mixed with a glan	dular secretion	(d) Mucus	
230.	When honey is stored i	n the honey sac, it is mixe	ed with the		
	(a) Enzymes for the pro	oduction of fructose and g	lucose		
	(b) Saliva for increasin	g the quantity			
	(c) Preservative to keer	honey for long time	(d) Water to make the	nectar less viscous	
221	At a time queen of hon	ev bees lays about	(a) water to make the		
231.	(a) 2000 ergs	(b) 20000eggs			
	(a) $2,000 \text{ cggs}$	(d) 20,000 eggs $(d) 20,000 = 25,000 \text{ eggs}$	70		
	(c) 200 eggs	(u) $20,000 - 25,000 \text{ egg}$	20		
232.	(a) Nactor of flower				
	(a) Nectar of flower (b) Nectar stored in the	honou sao			
	(b) Nector mixed with solive and stored in honey see				
	(c) Nectar mixed with sanva and stored in honey sac				
	(u) Nectal and water st	icked by the honey bee	is given more food in	comparison to others it	
233.	3. Fertilized egg develops into larva and when it is given more food in comparison to others, i develops into				
	(a) Drone	(b) Queen	(c) Soldier	(d) Worker	
234.	The composition of hor	ney is			
	(a) Water, sucrose and	dextrin			
	(b) Glucose, fructose, w	water sucrose, dextrin prot	eins, vitamins and miner	als	
	(c) Water, proteins, suc	crose and dextrin			
	(d) Water, sucrose, glu	cose and dextrin			
235.	Nobel prize winner for	the discovery of method of	of interpersonal commun	ication in honey bee is	
	(a) Von Frisch	(b) H.G. Khorana	(c) Harvey	(d) Darwin	
236.	If a honey bee is conve	ying an information, then	the distance of source w	ill be about	
	(a) 1000 meters	(b) 50 meters	(c) 2000 meters	(d) 150 meters	
237.	Special dance in honey	bee is for	(b) Destruction of anon	av haas	
	(a) Reproduction		(d) Convey the information	ity bees	
228	Honey is		(d) Convey the morna	thom of food source	
230.	(a) Acidic	(b) Neutral			
	(c) Alkaline	(d) Basic after some day	/S		
239.	Honey be is of greatest	use to man due to which	reason		
	(a) We get honey from	them	(b) Helps in cross polli	nation	
	(c) Is of medicinal value	ie	(d) Entertains		

240.	Life span of worker be	e is			
	(a) 10 days	(b) 15 days	(c) 6 weeks	(d)	10 weeks
241.	Honey bee keeps the ne	ectar for sometime in its			
	(a) Stomach	(b) Salivary gland	(c) Crop	(d)	Mouth
242.	In unfavorable condition	ons the flight of whole colo	ony from their hive to an	y ne	w place is called
	(a) Super session	(b) Marriage flight	(c) Swarming	(d)	Group flight
243.	The honey bees exhibit	t a type of dance to comm	unicate the location of fo	od. 7	This is known as
	(a) Waggle dance		(b) Tap dance		
	(c) Round dance and w	aggle dance	(d) Break dance		
244.	2.1 gm of honey provid	les			
	(a) 40 kcal of energy	(b) 67 <i>kcal</i> of energy	(c) 36 <i>kcal</i> of energy	(d)	60 kcal of energy
245.	In which bee barbless s	sting is found			
	(a) Drone	(b) Workers	(c) Queen bee	(d)	In all the three
246.	Largest amount of hone	ey is obtained from which	honey bee		
	(a) Apis indica	(b) Apis dorseta	(c) Apis floria	(d)	Apis domestica
247.	Chemically honey is				
	(a) Monosaccharides	(b) Disacchrides	(c) Polysaccharides	(d)	Proteins
248.	Honey bee species rear	ed most widely in India is			
	(a) Apis indica	(b) Apis dorsata	(c) Apis florea	(d)	Apis mellifera
249.	A queen Honey bee lay	vs eggs of			
	(a) One type from whic	ch all castes develop			
	(b) Two types, one form	ning queen and workers a	nd second forming drone	S	
	(c) Three types forming	g queen, drone and worker	CS 11		
	(d) Unfertilised eggs d	ie while fertilised ones for	rm all castes		
250.	Bee venom is used to c	ure	() T	(1)	D 112
	(a) Cystitis	(b) Arthiritis	(c) Laryngitis	(d)	Bronchitis
251.	If the source is opposite	e to the direction of sun, th	nen honey bee will conve	ey the	e direction by
	(a) Clockwise round da	ince	(b) Upright down tail w	'aggı	ng dance
	(c) Anticlockwise roun	d dance	(d) Opposite to (b)		
252.	There is aon the ot	iter surface of the hind tib	ia in the workers honey l)ee	TT '
	(a) Larsus	(b) Pollen basket	(c) Hook	(a)	Hairs
253.	Honey bee after discov	ering the new source of ne	ectar/honey can convey t	h18 11	nformation but
	(a) Cannot convey the	direction			
	(b) Can convey the dire	ection by round or tail wag	gging dance		
	(c) Can convey the dire	ection by round dance only	ý		
	(d) Can convey the dir	ection by tail wagging dar	nce only		

254.	. The stimuli through which a dancing scout bee communicates the location of a food source to other worker bees in a hive are				
	(a) Visual	(b) Acoustic	(c) Contact	(d) Contact and visual	
255.	Among the following c	olonial are			
	(a) Locusts	(b) White ants	(c) Bed bugs	(d) Mosquitoes	
256.	In which bee wax gland	ls are found			
	(a) Queen bee		(b) Drone		
	(c) Workers		(d) Both in queen and v	worker bees	
257.	In the drones of honey This indicates that	bee, there is no reduction	in chromosomes number	r during spermatogenesis.	
	(a) Drones are diploid				
	(b) The drones are prod	luced due to loss of one se	et of chromosomes from	the fertilized egg	
	(c) The drones are brought up on an inferior diet				
	(d) The drones are pro-	duced parthenogenetically			
258.	In which part of the bo	dy "Pollen basket" is foun	d in the honey bee		
	(a) Prothoracic leg		(b) Mesothoracic leg		
	(c) Metathoracic leg		(d) At union of thorax	and abdomen	
259.	Which of the following	species of honey bee is re	eared in artificial hives		
	(a) Apis indica	(b) Apis dorsata	(c) Apis florea	(d) None of these	
260.	Which of the following	s is a correct statement			
	(a) Drone is diploid		(b) Apis indica is large	st wild bee	
	(c) Wax is excretory pr	oduct of bee	(d) Frisch discovered communication in bees		
261.	In which of the followi	ng is 'swarming' found			
	(a) In mosquitoes	(b) In house flies	(c) In locust	(d) In pyrilla	
262.	Which one of the follow	wing insects produces hon	ey		
	(a) Antherae paphia	(b) Apis indica	(c) Kerria lacca	(d) Bombyx mori	
263.	Assertion (A) : The ho	ney bee queen copulates of	only once in her life time		
	Reason (R) : The hone	y bee queen can play ferti	lized as well as unfertili	zed eggs	
	(a) If both assertion and	d reason are true and the re	eason is the correct expla	anation of the assertion	
	(b) If both assertion a assertion	nd reason are true but t	he reason is not the co	prrect explanation of the	
	(c) If assertion is true s	tatement but reason is fals	e		
	(d) If both assertion an	d reason are false			

LAC INDUSTRY

Basi	ic Level				
264.	Lac is produced by				
	(a) Males		(b) Females		
	(c) Far more by female	s than males	(d) More by males that	n females	
265.	Lac is a				
	(a) Plant product	(b) Insect product	(c) Mineral product	(d) Synthetic product	
266.	Lac is the best				
	(a) Raw bangles materi	al (b)Cosmetic material	(c) Polishing material	(d) Sealing material	
267.	Raw lac is separated free	om the twigs of tree by dis	ssolving it into		
	(a) Organic solvent	(b) Hot alcohol	(c) Hot water	(d) Cold water	
268.	Lac is used in				
	(a) Varnish industry only				
	(b) Printing and varnish	n industries only			
	(c) Gramophone record	ls, varnish, electrically ins	ulated goods and printin	g industries	
	(d) None of these				
269.	Largest Lac producing	country is			
	(a) Japan	(b) Phillipines	(c) India	(d) China	
270.	Lac is produced as				
	(a) Faces of lac insect		(b) Secretion from bod	У	
	(c) Excretion from bod	У	(d) Excess food oozing	out of body	
271.	(c) Excretion from bod The commercial lac is	y produced in large quantitie	(d) Excess food oozing es by	out of body	
271.	(c) Excretion from bodThe commercial lac is p(a) Male insect	y produced in large quantitie (b) Female insect	(d) Excess food oozinges by(c) Both (a) and (b)	out of body (d) None of the above	
271. 272.	(c) Excretion from bodThe commercial lac is p(a) Male insectWhich lac secreting insect	y produced in large quantitie (b) Female insect sect undergoes death after	(d) Excess food oozinges by(c) Both (a) and (b)reproduction	out of body (d) None of the above	
271. 272.	(c) Excretion from bodThe commercial lac is p(a) Male insectWhich lac secreting ins(a) Male	y produced in large quantitie (b) Female insect sect undergoes death after (b) Female	 (d) Excess food oozing es by (c) Both (a) and (b) reproduction (c) Worker 	out of body(d) None of the above(d) None of these	
271. 272. 273.	 (c) Excretion from bod The commercial lac is p (a) Male insect Which lac secreting ins (a) Male Indian Lac Research In 	y produced in large quantitie (b) Female insect sect undergoes death after (b) Female stitute is situated at	 (d) Excess food oozing es by (c) Both (a) and (b) reproduction (c) Worker 	out of body (d) None of the above (d) None of these	
271. 272. 273.	 (c) Excretion from bod The commercial lac is p (a) Male insect Which lac secreting ins (a) Male Indian Lac Research In (a) Ranchi 	y produced in large quantitie (b) Female insect sect undergoes death after (b) Female stitute is situated at (b) Mysore	 (d) Excess food oozing es by (c) Both (a) and (b) reproduction (c) Worker (c) Dehradoon 	out of body(d) None of the above(d) None of these(d) Nagpur	
271.272.273.274.	 (c) Excretion from bod The commercial lac is p (a) Male insect Which lac secreting ins (a) Male Indian Lac Research In (a) Ranchi Lac is obtained from 	y produced in large quantitie (b) Female insect sect undergoes death after (b) Female stitute is situated at (b) Mysore	 (d) Excess food oozing es by (c) Both (a) and (b) reproduction (c) Worker (c) Dehradoon 	 out of body (d) None of the above (d) None of these (d) Nagpur 	
271. 272. 273. 274.	 (c) Excretion from bod The commercial lac is p (a) Male insect Which lac secreting insect (a) Male Indian Lac Research In (a) Ranchi Lac is obtained from (a) Laccifer 	y produced in large quantitie (b) Female insect sect undergoes death after (b) Female stitute is situated at (b) Mysore (b) <i>Bombyx</i>	 (d) Excess food oozing es by (c) Both (a) and (b) reproduction (c) Worker (c) Dehradoon (c) Dactylopius 	 out of body (d) None of the above (d) None of these (d) Nagpur (d) Lytta 	
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 271. 272. 273. 274. 275. 276. 	 (c) Excretion from bod The commercial lac is p (a) Male insect Which lac secreting insect (a) Male Indian Lac Research In (a) Ranchi Lac is obtained from (a) <i>Laccifer</i> Lac is obtained from (a) Faecal matter of laccification (c) Excretion of insect True for laccifer laccation (a) Lives upon trees of (c) Parthenogensis occur 	y produced in large quantitie (b) Female insect sect undergoes death after (b) Female stitute is situated at (b) Mysore (b) <i>Bombyx</i> insect is fig family and secretes resur	 (d) Excess food oozing es by (c) Both (a) and (b) reproduction (c) Worker (c) Dehradoon (c) Dactylopius (b) Secretion from body (d) Excess food from body (e) Males are sterile (f) None of these 	 out of body (d) None of the above (d) None of these (d) Nagpur (d) Lytta y y y y y and secrete resin 	
 271. 272. 273. 274. 275. 276. 277. 	 (c) Excretion from bod The commercial lac is p (a) Male insect Which lac secreting insect (a) Male Indian Lac Research In (a) Ranchi Lac is obtained from (a) <i>Laccifer</i> Lac is obtained from (a) Faecal matter of lac (c) Excretion of insect True for laccifer laccation (a) Lives upon trees of (c) Parthenogensis occur The female of lac insect 	y produced in large quantitie (b) Female insect sect undergoes death after (b) Female (b) Female (b) Mysore (b) <i>Bombyx</i> (b) <i>Bombyx</i> (c) <i>Bombyx</i> ((d) Excess food oozing es by (c) Both (a) and (b) reproduction (c) Worker (c) Dehradoon (c) Dehradoon (c) Dactylopius (b) Secretion from body (d) Excess food from the set in time (c) None of these 	 out of body (d) None of the above (d) None of these (d) Nagpur (d) Lytta y y	

278.	The larvae of lac insec	ts feed upon		
	(a) Leaves of the plant		(b) Stem of the plant	
	(c) Juice of the plant fi	rom phloem	(d) Insects of other groups	
279.	Lac insect is a			
	(a) Symbiont insect	(b) Commensal insect	(c) Parasitic insect	(d) Both (a) and (b)
280.	Order of lac insect is			
	(a) Hymenoptera	(b) Lepidoptera	(c) Hemiptera	(d) Diptera
281.	Main composition of la	ac is		
	(a) Glue, pigment and	sugar	(b) Wax, pigment and	glue
	(c) Resin, pigment, wa	x and glue	(d) Resin, sugar and w	vax
282.	Lac is secreted by			
	(a) Salivary glands	(b) Cephalic glands	(c) Cutaneous glands	(d) Oral glands
283.	Which one of these is a	a secretion from body of a	an insect	
	(a) Honey	(b) Lac	(c) Pearl	(d) Coral
284.	Commercial seed lac is	s produced from		
	(a) The roots of a type	of plant	(b) The nests of a type	of bird
	(c) The exuviae of a ty	pe of insect	(d) The scales of a type of fish	
285.	Commercial lac is prod	duce from		
	(a) The nest of a type of	of bird	(b) The exudation of a	type of insect
	(c) The scale of a type	of fish	(d) The root of a plan	t
286.	Chemical nature of lac	is		
	(a) Protein	(b) Carbohydrate	(c) Metalloid	(d) Resin
287.	Male and female capsu	iles are respectively		
	(a) Tubular and rounde	ed	(b)Tubular and irregul	ar
	(c)Rounded and tubula	r	(d) Rounded and irreg	ular
288.	Lac contains how muc	h percent wax		
	(a) 1 %	(b) 4%	(c) 6%	(d) 10%
289.	Lac contains how muc	h percent resins		
	(a) 40%	(b) 50-55%	(c) 68-90%	(d) 90-95%
		POUL	<u>TRY</u>	
Basi	ic Level			
290.	The young chicken rai	sed specifically for meat a	are called	

0		Jen		
	(a) Broilers	(b) Cockerels	(c) Pellets	(d) Hen
291.	The broilers are birds ra	aised for		
	(a) Feathers	(b) Eggs	(c) Cock-fighting	(d) Meat
292.	Pure breeds of fowls ar	e		
	(a) Aseel, Bursa	(b) Ghagus	(c) Brahma & Cochin	(d) All of these

293.	Fowl cholera is caused	by								
	(a) Virus	(b) Bacteria	(c) Protozoan parasites	(d) Nematode parasites						
294.	Which one is most rece	ent domestication								
	(a) Buffalo	(b) Sheep	(c) Turkey	(d) Silkworm						
295.	Poultry includes	· · · •	•							
	(a) Fowl, duck, tortoise	e and turkey	(b) Fowl, duck, pigeon and tortoise							
	(c) Duck, fowl, tortoise	e and turtle	(d) Fowl, duck, turkey and pigeon							
296.	Poultry diseases includ	e								
	(a) Fowl typhoid, blue	tongue, ranikhet	(b) Fowl typhoid, tick f	ever, blue tongue						
	(c) Ranikhet, blue gong	gue, tick fever	(d) Fowl typhoid, ranik	het, tick fever						
297.	Laghorn hen lays how	many eggs in a year								
	(a) 8	(b) 80	(c) 800	(d) 220						
298.	Main product of poultr	y is								
	(a) Eggs	(b) Chicken	(c) Meat	(d) Eggs and meat						
299.	Which is a fungal disea	ase of poultry								
	(a) Fowlpox	(b) Thrush	(c) Ranikhet	(d) Pullorum						
300.	Which of the following	g is a common disease in p	oultry							
	(a) Encephalities	(b) Ranikhet disease	(c) Fowl cholera	(d) Taeniasis						
301.	In poultry farming is in	cluded rearing of								
	(a) Fowls only		(b) Fowls and ducks							
	(c) Fowls and pheasant	s and turkey	(d) All of these							
302.	A hen of good variety l	ays about								
	(a) 240 eggs every year	ſ	(b) 240 eggs every month							
	(c)60 eggs every month	1	(d) 112 eggs every year							
303.	Ranikhet, coryza, chole	era and pox are diseases of	f							
	(a) Human beings	(b) Horse	(c) Cattle	(d) Poultry						
304.	Ranikhet diseases conn	ected with								
	(a) Honey bee	(b) Hens	(c) Fishes	(d) Pigs						
305.	Which of the following	g is not an excellent egg-la	ying breed							
	(a) Single-comb white	Leghorn	(b) Rhode Island red							
	(c) New Hamshire		(d) Australorps							
306.	The deficiency of vitan	nin E causes which diseas	e in poultry							
	(a) Fowl cholera	(b) Encephalomalacia	(c) Ceryza disease	(d) Pulerum disease						
307.	Fowl pox is caused by									
	(a) Ectoparasites	(b) Endoparasites	(c) Bacteria	(d) Virus						
308.	Ranikhet disease is cau	ised by								
	(a) Bacteria	(b) Virus	(c) Fungus	(d) Parasite						

309.	Exotic breeds of fowls	are											
	(a) White Leghorn and	Ply mouth Rock	(b) Rhode Island Red a	nd Australorp									
	(c) Sussex and minorca	L	(d) All the above										
310.	Pullorum disease of por	ultry is known as											
	(a) White diarrhoea	(b) Coccidiosis	(c) Fowl pox	(d) None									
311.	Which is a fungal disea	se of poultry											
	(a) Aspergillosus	(b) Pox	(c) Cholera	(d) Ranikhet									
312.	2. Induced egg laying is due to the injection of												
	(a) Egg extract in the body (b) Egg extract orally												
	(c) Pituitary extract in t	the body	(d) Ovary extract in the	e body									
313.	Nutritional diet of poultry birds includes												
	(a) Cereals, oil cakes, milk cakes, green vegetables (b)Millets, proteins, oil cakes only												
	(c) Cereals, millets, proteins, oil cakes, green vegetables												
	(d) Proteins, oil cakes, cereals only												
314.	. Typhoid and parathyphoid in poultry are caused by												
	(a) Salmonella species	(b) Histomonas	(c) Haemophrlus	(d) Pasteurella									
315.	In India, which state oc	cupies first position in po	ultry farming										
	(a) Kerala	(b) M.P.	(c) Andhra Pradesh	(d) U.P.									
316.	In poultry industry, pro	oduction of hatching eggs	is more expensive than	the production of market									
	eggs mainly because												
	(a) Cost of males and the	heir depreciation value is h	nigh										
	(b) Mortality among fer	males is usually lower who	en they are mated with n	nales									
	(c) Number of eggs pro	duced by hatchery flock a	re to be sold only as ma	rket eggs									
	(d) Some of the eggs pr	oduced by hatchery flocks	s are not acceptable for i	ncubation									
317.	Birds specially chicken	grown for meat only is kr	nown as										
	(a) Hybrid	(b) Broiler	(c) Bird management	(d) Bird culture									
318.	HH 260 is a breed of												
	(a) Cock	(b) Pig	(c) Buffalo	(d) Hen									
319.	Match the different chi	ckens given under column	-I with their respective	uses given under column-									
	II,												

	Column – I	Column – II						
	(Chickens)	(Uses)						
Α	Aseel	р	Dual purpose					
В	Chitagong	q	Cross between local and					
			exotic					
C	Giriraj	r	Best layer in the world					
D	White leghorn	S	Broiler					
		t	ideal table bird					

Choose the answer which gives the correct combination of alphabets of two columns.

(a) A = p, B = q, C = t, D = s (b) A = t, B = p, C = s, D = r

(c) A =t, B =p, C =q, D =r (d) A =p, B =r, C =s, D =t

320. The fungal disease of poultry is

Rasic Level

5-00	· · · · · · · · · · · · · · · · · · ·										
	(a) Coccidiasis	(b) Monilliasis	(c) Coryza	(d) Mareks							
321.	Pullorum disease of pop	ultry is caused by									
	(a) Virus	(b) Aspergillus	(c) Eimeria	(d) Salmonella							
322.	Cause of fatty liver syn	syndrome in poultry is									
	(a) Parasite	(b) High temperature	(c) Lack of O_2	(d) Cage system							
323.	Histomonas causes this	disease in poultry									
	(a) Coryza disease	(b) Coccidioses									
	(c) Black head disease (d) Chronic respiratory disease										
324.	Pigeon flesh is used for	treating									
	(a) Blood pressure	(b) Heart disease	(c) Paralysis	(d) Diabetes							
325.	Indian Runner is a bree	d of									
	(a) Camel	(b) Horse	(c) Fowl	(d) Duck							
326.	Which of the following	fowls are used in cock-fig	ghting								
	(a) Assel	(b) Bursa	(c) Ghagus	(d) Brahma							

FISHERIES

Dast									
327.	Induced breeding is can	rried out in case of							
	(a) Pisciculture	(b) Apiculture	(c) Sericulture	(d) Lac culture					
328.	Inland fisheries are								
	(a) Deep sea fishing		(b) Capturing fishes from sea coast						
	(c) Raising and capturi	ng fishes in fresh water	(d) Oil extraction from fish						
329.	Best aquarium is locate	ed at							
	(a) Vishakhapatnam	(b) Chennai	(c) Tarapur, Mumbai	(d) Z.S.I. Calcutta					
330.	Aquaculture involves p	production of							
	(a) Usual aquatic plants	S	(b) Useful aquatic animals						
	(c) Useful aquatic plan	ts and animals	(d) Harmful aquatic plants and animals						
1									

331.	In land fishery deals wi	ith the fishery aspects of v	vaters of					
	(a) Ponds	(b) Rivers	(c) Lakes	(d) All the above				
332.	Aquaculture includes							
	(a) Marine fisheries	(b) Inland fisheries	(c) Both (a) and (b)	(d) None of these				
333.	'Pisciculture' is culture	of						
	(a) Aquatic animals	(b) Prawns	(c) Fishes	(d) None of these				
334.	The important food fish	n is						
	(a) Rohu	(b) Catla	(c) Wallago	(d) Clarius				
335.	Estuarian fish culture in	ncludes the fishes		< / ·				
	(a) Hilsa and Liza	(b) Rohu and Hilsa	(c) Wallago and Hilsa	(d) Catla and Hilsa				
336.	Culture of fishes only i	n fresh water is known as		< / ·				
	(a) Aquaculture	(b) Inland fisheries	(c) Pisciculture	(d) None of these				
337.	Catla, singhara, magur	and sindhi Fishes are four	nd in					
,	(a) North, East and Sou	ıth India	(b) North and South Ind	dia				
	(c) East and West India	l	(d) All over India					
338.	Shark liver oil and cod	liver oil is a natural rich s	ource of					
	(a) Fat	(b) Vitamin A and C only	y (c)Vitamin A, C and	d D (d)Protein				
339.	Estuarian fish culture is	s a culture of fish in						
	(a) Marine water							
	(b) Fresh water of river							
	(c) Fresh water of pond	1						
	(d) Aquatic medium wh	nere fresh and marine wate	er get mixed together					
340.	Cod liver oil is extracte	ed from						
	(a) Bony fishes	(b) Cartilagenous fishes	(c) Buffaloes	(d) Whales				
341.	Cod liver oil is a rich se	ource of						
	(a) Iodine	(b) Vitamin A	(c) Vitamin B	(d) Vitamin C				
342.	The Indian carp is							
	(a) Scoliodon	(b) Labeo	(c) Torpedo	(d) Pristis				
343.	Fresh water fishes which	ch have a great food value	are					
	(a) Rohu, Catla, Clariu	s, Mystus	(b) Rohu, Catla, Eel, H	ilsa				
	(c) Rohu, Catla, Wallag	go, Hilsa	(d) Rohu, Catla, Salmo	n, Clarius				
344.	Which of the following	g is not a freshwater fish						
	(a) Hilsa	(b) Catla	(c) Clarius	(d) Mystus				
345.	Name of a freshwater e	cdible fish						
	(a) Hilsa	(b) Pomphret	(c) Calbasu	(d) Bombay duck				
346.	Aquaculture involves p	production of	(h) Oustars					
	(a) Fishes, shiftings, lot	isters and crabs	(d) All the above					
247	Non edible part of field	hes such as tails fine and	d hones which are disc	arded from factories that				
547.	vields	nes suen as tans, mis all	a cones which are ulsed					
	(a) Fertilisers	(b) Adhesives	(c) Oil	(d) All the above				
			(-) •••					

348.	Fish meal is								
540.	(a) Food given to fish which are reared for eating	(b) Synthetic fertilizer							
	(c) Non-edible part of fish used for feeding cattle	(d) Cooked fish							
349.	Which of the following is not a marine fish	()							
010	(a) Rohu (b) Salmon	(c) Pomphret	(d) Hilsha						
350.	Bombay duck is								
	(a) Duck found at Bombay coast	(b) A mollusc commonly known as duck							
	(c) A marine fish	(d) Nothing							
351.	Some important edible marine fishes found on In	dian coast are							
	(a) Bombay duck, Sardine, Hilsa	(b) Salmon, Singhi, Hil	sa						
	(c) Pomphret, Sardine, Malli	(d) Eel, Sardine, Singhi	ĺ						
352.	Which one of the following edible fishes is introd	luced in India by foreign	iers						
	(a) Labeo rohita (b) Stromateus argenteus	(c) Mystus singhala	(d) Clarias batrachus						
353.	Three carp fishes, Catla Labeo and Cirrhina	can be grown together	in the same pond more						
	economically as they have								
	(a) Positive interactions (b)Commensalism								
	(c) Symbiosis (d)No competition for	r food							
354.	Fish commonly raised by polyculture are								
	(a) <i>Labeo rohita</i> (b) <i>Catla catla</i>	(c) Mystus singhala	(d) Both (a) and (b) $(a) = (a) + ($						
355.	The Indian fresh water prawn is								
	(a) Panaeus (b) Palaemon	(c) Palaemneus	(d) None of these						
356.	The esturine fish is		(1) A 11 - f (1						
	(a) Chanos (b) Scollodon	(c) Cirrinus	(d) All of these						
357.	(a) Ropy fishes (b) Lung fishes	(a) Cartilaginous fishes (d) Combusis							
258	(a) bony fishes (b) Lung fishes	(c) Cartilaginous fisnes (d) Gambusia							
350.	(a) It has more proteins	(b) It has more fats							
	(c) It has lesser carbohydrate	(d) None of these							
350.	Which of these is an exotic fish	(d) I tone of these							
555	(a) Gourami (b) Sardine	(c) Anchory	(d) Meckerel						
360.	Important edible fresh water fishes of India are								
-	(a) Labeo, Calbasu, catla	(b)Mystus, Clarius, Ana	abas						
	(c) Heteropneustes, Wallago	(d) All of the above							
361.	Which of the following is a freshwater food fish								
-	(a) <i>Harpodon</i> (b) <i>Cirrhina mrigala</i>	(c) Anguilla	(d) Hilsa						
362.	Important edible marine fishes of India are		· · ·						
	(a) Bombay duck, Salmon (b)Hilsa, Pomphret	(c) Eel, Sardine	(d) All the above						
363.	The common name of a marine fish Anguilla. is								
	(a) Rohu (b) Hilsa	(c) Eel (d) Bombay du							
364.	Common name of 'Wallago attu' is	× /							
	(a) Indian Shark (b) Blue shark	(c) Fresh water shark	(d) Saw fish						

365.	Gambusia is a									
0.0.	(a) Predator of mosqui	to larvae	(b) Parasite on crab							
	(c) Pathogenic protozo	an	(d) Pest on fishes							
366.	Which one of the follo	wing is an economically i	important exotic food fish being cultured in India							
	(a) Major carp	(b) Minor Carp	(c) Crusian carp	(d) Big head carp						
367.	Exotic fish are									
	(a) Gambusia	(b) Gold fish	(c) Trout and trench	(d) All of the above						
368.	Which one of the follo	wing food fish of Uttar Pr	adesh is without scales							
	(a) Hypothalmicoblhys	molitrix	(b) Labeo rohita							
	(c) Channa Punctatus		(d) Wallago attu							
369.	Fish meal is									
	(a) Food of fish		(b) Some aquatic insec	t						
	(c) Edible part of fish		(d) Non edible part of a	fish used as fodder						
370.	Which one is not produ	aced in aquaculture								
	(a) Oyster	(b) Silk worm	(c) Singhara	(d) Frog						
371.	Isinglass a type of by p	product of fish industry is	principally used for							
	(a) Feeding cattle, pigs	and poultry	(b) Preparation of pain	ts and varnishes						
	(c) Clarification of vin	egar, wines and beer	(d) Production of insul	in						
372.	Induced breeding is eff	fective in which of them								
	(a) Pisciculture	(b) Sericulture	(c) Apiculture	(d) Lac cultrure						
373.	The sucker fish is tech	nically called								
	(a) Saccobranchus	(b) Anabas	(c) Echenies	(d) Sphyma						
374.	Fish introduced in Indi	a by foreigners is								
	(a) <i>Labeo rohita</i>	(b) Mystus singhala	(c) Pompret	(d) Clasius batrachus						
375.	Isinglass is prepared in	(h) Musik daar	(a) Fishes	(d) Lizanda						
	(a) ichtryophis The fish food possesse	(b) Muck deel	(C) FISHES	(u) Lizalus						
376.	(a) Actin	(b) Myosin	(c) Cholesterol	(d) Tissue fluid						
200	Fish used in biological	control of mosquito is	(c) choicsteroi	(u) Hissue Hulu						
3//•	(a) Gambusia	(b) Hilsa elisa	(c) Scalophagys	(d) Gold fish						
378.	The great fisher bank i	s situated of	(e) beatophagys	(u) Gold Hill						
5700	(a) The coast of new fo	oundland	(b) The chilean coast							
	(c) The spanish coast		(d) The coast of great l	Britain						
379.	A lake with an inflow	of domestic sewage rich in	n organic waste may resu	ılt in						
	(a) Drying of the lake	very soon due to algal blo	om							
	(b)An increased produ	ction of fish due to lot of i	nutrient							
	(c) Death of fish due to	b lack of oxygen								
	(d) Increased population	on of aquatic web organisr	n							
380.	Minamata disease was	caused due to the consum	ption of							
	(a) Sea food containing	g lot of cadmium	(b) Fish contaminated	with mercury						
	(c) Ovester with lot of	pesticide	(d) Sea food contamina	ated with selenium						
	() = j = 5002 101 100 01	r	(

381. Assertion (a) : Fish meals is a rich source of protein for cattle and poultry

Reason (**R**) : fish meal is produced from non – edible part of fishes like fins, tail etc.

(a) If both assertion and reason are true and the reason is the correct explanation of the assertion

(b) If both assertion and reason are true but the reason is not the correct explanation of the assertion

(c) If assertion is true statement but reason is false

(d) If both assertion and reason are false

PEARL INDUSTRY

Basic Level

382.	2. Who is referred to as 'father of pearl industry'									
	(a) Inovsky	(b) Louis Pasteur	(c) Kokichi Mikimoto	(d) Harvey						
383.	Pearl is secreted by									
	(a) Nacreous layer	(b) Prismatic layer	(c) Mantle layer	(d) Both (a) and (b)						
384.	Natural pearl is formed	l by								
	(a) A bivalve	(b) Prawn	(c) Crayfish	(d) Fish						
385.	The production of pear	l artificially is known as								
	(a) Pearl production	(b) Pearls culture	(c) Pearl manufacture	(d) Both (a) and (b)						
386.	Who stands first in the	world for pearl production	n							
	(a) India	(b) China	(c) Korea	(d) Japan						
387.	Shells of molluscs are u	used for preparing ointmen	nts because they are rich	in						
	(a) Zinc	(b) Iodine	(c) Sodium	(d) Both (a) and (b)						
388.	Which pearl is rare									
	(a) White	(b) Cream	(c) Pink red	(d) Rainbow colour						
389.	A pearl oyster secrets p	bearls to								
	(a) Regenerate injured	parts	(b) Protect itself agains	t invading parasite						
	(c) Harden its mantle c	avity	(d) Isolate damaged tissues of the body							
390.	Pearl is produced by th	e marine molluscs such as	5							
	(a) Pearl oyster and mu	issel	(b) Pearl oyster							
	(c) Marine mussel		(d) Fresh water mussel and other bivalvia							
391.	Pearl contains now mu	chwater								
	(a) 2- 4%	(b) 10 %	(c) 12 - 15%	(d) 15 - 20%						
392.	Pearl producing mollus	scan species is								
	(a) Pinctada vulgaris	(b) Mytilus viridis	(c) Solen campii	(d) Tridecna maxima						
393.	Composition of pearl is	8								
	(a) Only calcium carbo	nate		(b) Only colchicin						
	(c) Calcium carbonate,	water, organic matter and	other minerals	(d) Both (a) and (b)						
394.	The pearl bed which pr	oduces best quality is kno	wn as							
	(a) Lingha pearl	(b) Muktaphal	(c) Kusum	(d) Both (a) and (b)						
395.	The composition of pea	arl is very much similar to	that of							
	(a) Mantle layer	(b) Nacreous layer only	(c) Prismatic layer only	(d) Both (a) and (b)						
1										

396.	Pearl producing indian	species is											
	(a) Pinctada indica	(b) Ostrea indica	(c) Pinctada vulgaris	(d) Ostrea vulgaris									
397.	Pearl is secreted around	l the											
	(a) Mantle layer												
	(b)Foreign particle between prismatic and nacreous layer												
	(c) Foreign particle bet	s layer	(d) The shell										
398.	Which of the following	is detrimental to pearl inc	lustry										
	(a) Cliona	(b) Cheloina	(c) Pinctada	(d) Euspongia									
399.	9. The most valuable kind of pearl comes from marine pearl oyster of Eastern Asia, it is												
	(a) Melegrina	(b) Ostrea virginiana	(c) Pinctada	(d) Mytilus									
400.	Whose secretion forms	the pearl											
	(a) Prismatic layer		(b) Columnar epithelial	cells of mantle									
	(c) Ciliated epithelial c	ells of mantle	(d) Connective tissue o	f mantle									
401.	Which one of the follow	wing molluscan groups is	is primarily used in the pearl formation										
	(a) Monopalacophoran	s (b)Cephalopods	(c) Gastropods	(d) Pelecypods									
402.	Pearls are produced in a	an oyster around the											
	(a) Tears of sea merma	ids falling into the oyster											
	(b) First drops of rains	falling into the oyster in a	particular month										
	(c) Eggs oyster which f	ails to leave its body											
	(d) Some external partie	cles becoming embedded	in the skin of oyster										
403.	Which one of the follow	wing mollusc is cultured in	n fresh water for produci	ng pearls]									
	(a) Pinctada	(b) Haliotis	(c) Anodonta	(d) Mytilus									
404.	Which of the following	is associated with format	ion of pearl										
	(a) Pecten	(b) Ostrea	(c) Pinctada	(d) Nautilus									

<u>ANSWER</u>

ASSIGNMERNT (BASIC & ADVANCE LEVEL)

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
c	d	b	c	d	c	c	d	d	c	d	b	a	d	b	c	a	d	c	b
21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
d	b	a	d	a	c	a	c	a	b	a	d	a	c	c	a	c	c	b	b
41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
a	c	b	a	c	b	c	d	a	b	b	a	a	a	c	c	d	a	a	b
61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80
a	d	c	d	d	c	b	c	d	c	b	c	b	a	c	d	b	b	a	b
81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
c	c	d	a	b	b	a	d	d	d	d	d	b	b	b	a	c	c	b	b
101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120
c	d	c	b	d	a	a	b	d	c	b	c	c	d	d	c	c	d	d	a
121	122	123	124	125	126	127	128	129	130	131	132	133	134	135	136	137	138	139	140
b	a	b	d	c	d	c	d	c	d	d	a	a	b	d	a	d	d	b	d
141	142	143	144	145	146	147	148	149	150	151	152	153	154	155	156	157	158	159	160
b	b	b	c	d	b	b	b	a	d	b	d	b	c	b	b	c	b	b	a
161	162	163	164	165	166	167	168	169	170	171	172	173	174	175	176	177	178	179	180
d	a	b	a	d	a	c	c	c	c	a	a	d	b	d	c	b	d	c	c
181	182	183	184	185	186	187	188	189	190	191	192	193	194	195	196	197	198	199	200
b	c	c	d	b	a	a	d	b	a	c	b	a	b	c	b	c	d	c	c
201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220
b	b	b	c	c	a	b	c	b	c	a	d	d	c	d	a	d	b	a	a
221	222	223	224	225	226	227	228	229	230	231	232	233	234	235	236	237	238	239	240
d	b	c	c	c	c	b	b	c	a	a	c	b	b	a	b	d	b	b	c
241	242	243	244	245	246	247	248	249	250	251	252	253	254	255	256	257	258	259	260
c	c	c	b	c	b	a	a	b	b	b	b	b	d	b	c	d	c	a	d
261	262	263	264	265	266	267	268	269	270	271	272	273	274	275	276	277	278	279	280
c	b	b	c	b	d	c	c	c	b	b	a	a	a	b	a	b	c	c	c
281	282	283	284	285	286	287	288	289	290	291	292	293	294	295	296	297	298	299	300
c	c	b	c	b	d	a	c	c	a	d	d	b	c	d	d	d	d	b	b
301	302	303	304	305	306	307	308	309	310	311	312	313	314	315	316	317	318	319	320
d	a	d	b	c	b	d	b	d	a	a	c	c	a	c	d	b	d	c	b
321	322	323	324	325	326	327	328	329	330	331	332	333	334	335	336	337	338	339	340
d	d	c	c	d	a	a	c	c	c	d	с	c	b	a	b	d	c	d	b

341	342	343	344	345	346	347	348	349	350	351	352	353	354	355	356	357	358	359	360
b	b	a	a	c	d	a	c	a	c	a	b	d	d	b	a	c	a	a	d
361	362	363	364	365	366	367	368	369	370	371	372	373	374	375	376	377	378	379	380
b	d	c	c	a	c	d	d	d	b	b	a	c	c	c	c	a	a	c	b
381	382	383	384	385	386	387	388	389	390	391	392	393	394	395	396	397	398	399	400
c	c	c	a	d	d	d	d	b	a	a	a	d	a	b	c	c	c	c	b
401	402	403	404						-										-
d	d	a	c																
