MODEL QUESTION PAPER – 2

BIO – ZOOLOGY

SECTION – A

Choose the correct answer :

1 . Which enzyme acts on milk protein ?

a) Pepsin
b) **Renin**
c) Lipase
d) Erypsin

2 . Transfer of heart valves from a daed person to another person is called ……..

a) homograft
b) **biological graft**
c) mechanical graf**t**
d) dead transplantation

3 . The large part of the diencephalon is …..

a) **thalamus**
b) hypothalamus
c) infundibulum
d) hypophysis

4 . The gastroenteritis is caused by .....

a) ***Salmonella choleraesuis***
b) *Entamoeba histolytica*
c) *Yersinia pestis*
d) *Trypanosomia gambiens*

5 . The pathogenic form of *Entamoeba histolytica* is the ……

a) encysted spore
b) **vegetative trophozoite**
c) merozoite
d) schizontes

6 . The term anthroponoses means ……

a) infections with parasite species that are maintained in animal alone
b) infections with parasite species that are maintained in animal and man
c) **infections with parasite species that are maintained in man alone**
d) infections with parasite species that are maintained in man , animal and mosquito

7 . The allergic reaction is characterized by …..

a) Ig G antibody
b) Ig A antibody
c) Ig M antibody
d) **Ig E antibody**

8 . …… is a technique by which the complete set of chromosomes are separated from a cell and are lined up .

a) **Karyotyping** b) B - lymphocytes
c) Macrophage d) Mast cells

9 . Which one of the following is a genetic disease …..

a) Cholera b) Malaria
c) **Huntington chorea** d) Rheumatic heart disease

10 . The process of producing genetically modified organisms is called …..

a) cloning b) **transfection**
c) transcription d) transformation

11 . Which of the following gases destroy ozone layer faster ?

a) Chloroflurocarbans b) Hydrochloroflurocarbans
c) **Chloro and Hydro chloroflurocarbans** d) Sulphur dioxide

12 . The hazardous biomedical wastes are usually disposed off by means of …..

a) surface impoundments b) deep well injection
c) **incineration** d) land fills

13 . Which of the following reserve is considered as a biologist's paradise ?

a) Nilgiri Biosphere Reserve b) **Gulf of Mannar**
c) Nanda Devi Biosphere Reserve d) Sundarban Biosphere Reserve

14 . The most popular and commercial fowl breed of India is …..

a) Dark Brahma b) Kadaknath
c) **White leghorn** d) Assel

15 . Name the instrument that is used to count the blood cells ……

a) **Haemocytometer** b) CT scan
c) Electrocardiogram d) Sphygmomanometer

16 . The lengthening of neck in giraffe is related to which proposition of Lamaeck ?

a) Use and disuse
b) **Needy organs will arise sooner or later**
c) Inheritance of acquired characters
d) Gradual increase in the size of the organism

SECTION – B

17 . What is a stent ?

A **stent** is a metal tube inserted in the narrowed coronary arteries with the help a **baloon catheter** during coronary angioplasty **.** It keeps the artery open .

18 . What is nyctalopia ?

Vitamin A is necessary for resynthesis of **Rhodopsin** or **Visual Purple** . **Nyctalopia** or night blindness is the first sign of vitamin A deficiency . Prolonged deficiency of vitamin A leads to degenerative changes in rods and cones and nervous layers of the retina.

19 . Define Zoonoses .

Parasitic infections which man acquires from animals are known as zoonotic infections or **zoonoses** . In the zoonoses , human infections are only accidental events . The parasite is not benefited since the chain of transmission is usually broken with human infection.

20 . What are interferons ?

Interferons are the anti viral proteins released by certain WBCs at the time of viral infection . Interferons make body cells more resistant to viral infections .

21 . What is meant by lysozyme ?

Lysozyme is an anti bacterial agent . It is present in secretions, such as **tears** and **saliva** . It digests bacterial cell walls and inhibits bacterial growth .

22 . Mention the reason for albinism .

Albinism is caused due to absence of melanin pigment . Albinism is an inborn error of phenyl alanine metabolism . In this , the mutated recessive genes ‘aa’ do not produce the tyrosinase enzyme , which converts DOPA (3,4 – dihydroxy phenyl alanine) into melanin in the melanocytes.

$$\text{DOPA} \xrightarrow{\text{tyrosinase}} \text{Melanin}$$

23 . Write any two uses of bioinformatics .

1. It helps to understand gene structure and protein synthesis.
2. It helps to know more about the diseases.
3. It helps to understand more about the thread of life - the DNA.
4.. It paves the way for the medical and bio engineering applications.

24 . What is the impact of global warming on ocean ?

Due to the warming of oceans, sea level will rise . Glacier ice will melt . It will cause further rise in sea level . As a result , in the 21st century sea level will rise from 9 to 88 cm . Such a rise will submerge many parts of countries.

25 . Mention the suitable areas for deriving wind energy .

In India , large coastal areas , hill areas and desert areas are suitable for deriving wind energy . The wind power is used for generation of electricity and water pumping . Wind farms are already located in Tamil Nadu, Gujarat, and Andhra Pradesh.

26 . What is outbreeding ?

Out breeding is mating of less closely related or unrelated animals.The individuals involved do not have a common ancestor in the preceeding 4-6 generations

27. What is glycosuria ?

The glucose from the blood is filtered by the glomeruli and reabsorbed by the uriniferous tubules. Glucose is present in trace amonts in normal urine. If the blood contains more glucose , the tubules cannot reabsorb all the glucose. The surplus glucose appears in urine . This condition is known as **glycosuria .** Glycosuria is the indication of the disorder , **diabetes mellitus .**

28 . What is Allopatric species ?

Species occupying different geographical areas . Ex : species of frogs in India and Srilanka . The two land areas are separated by the Gulf of Mannar.

SECTION – C

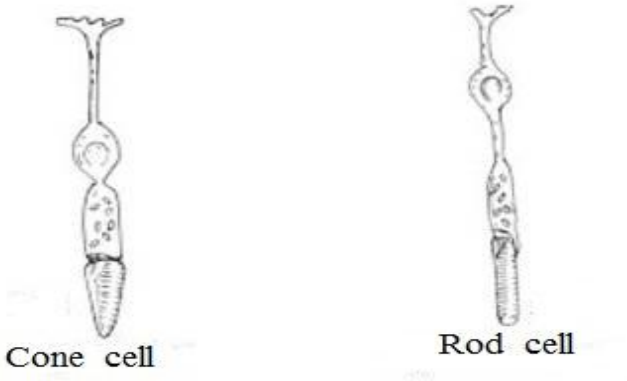
29 . Explain the method of reception of light by retina .

Eye

The visual system gives information about size, shape, color, luminosity and movements of object in the external world . The inner most layer of eye is Retina . It consists of two types visual receptors namely Rods and Cones .

Photochemistry of Retinal visual Pigments

Rhodopsin or **Visual Purple** is a photosensitive pigment present in the outer segment of the **rods** (120 million rods) . It is made up of protein portion called **Scotopsin** combined with an aldehyde of vitamin A called **Retinene** . On exposure to light , rhodopsin is broken down into scotopsin and retinene . But rhodopsin is resynthesised in the dark. The rods are extremely sensitive to light and are responsible for vision in dim light . This is called **SCOTOPIC VISION.**



Cones also contain rhodopsin pigments made up of **Retinene** , combined with a protein called **Photopsin** . Three pigments are found in man , each responding to different primary colors namely red , green and blue . . In bright light , maximum perception of colors is at the **fovea** region of the retina , where rods are absent and only cones are present. In dim light , the various colors appear as shades of grey. Cones are responsible for color perceptions in bright light . This is called **PHOTOPIC VISION.**

On photochemical basis , light energy is converted into nerve impulses. The impulses are interpreted by the brain as the appropriate intermediate colour. The perception of colour pictures is a complex function of the brain , It is performed by the cerebral cortex of the occipital lobe .

30 . Describe the structure of HIV .

Structure of HIV:

HIV is spherical in shape . Its size is about 100-140 nm . The genetic material is surrounded by a protein envelope . Several spicules of glycoprotein attach with both sides (inside and outside) of the protein envelope . The outer portion of glycoprotein is called gp120 . The gp120 appears like a knob . The gp 41 is situated in the inner side of the viral coat . The gp 41 is a long protein with over 100 amino acids.

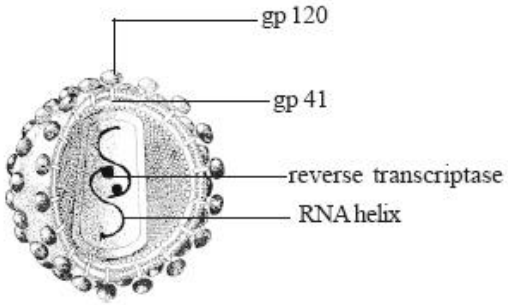


Fig. 2.11. Structure of HIV

Under Electron microscopic , the distribution of glycoprotein on the viral surface is very much like a soccer ball . The envelope of HIV also contains some HLA antigens (Human Leucocyte Antigen).

The genome of HIV contains two helix of RNA molecules . The enzyme reverse transcriptase is attached to RNA.

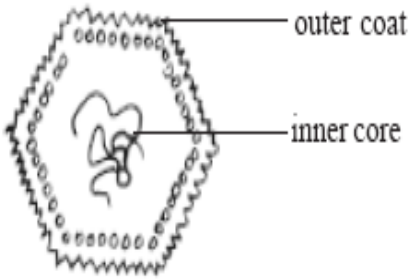
31 . Briefly describe the structure of virus .

Structure of Viruses:

Animal and plant viruses are composed of a central core of **nucleic acids** . It is surrounded by a protein coat called **capsid** . The capsid is made up small of units called **capsomeres** . Some animal viruses have an additional outer membrane called the **envelope** . The envelope is made up of **lipoproteins**. Viruses exhibit symmetry,

1. Spherical viruses are **isohedral** in symmetry .
2. Rod shaped viruses are **helical** in symmetry.
3. Certain viruses are **complex** in symmetry.

The envelope conceals the symmetry of viruses . Virions with envelopes are sensitive to lipid solvents such as ether and chloroform . On the other hand, the naked virions are not affected by the lipid solvents.



Morphology of viruses

T_2-bacteriophage

Isohedral symmetry found in adeno viruses , SV15 , polio viruses and blue tongued viruses . They are are spherical in shape .

Helical surface symmetry is found in the tobacco mosaic virus (TMV) and animal viruses that cause measles, mumps , influenza and rabies . In TMV the nucleic acid core is covered closely packed capsomeres arranged in a helix.

Complex or uncertain symmetry is seen in Pox viruses and T-bacteriophages,. These have different proteins and lipoproteins.

32 . Write notes on Karyotyping .

Karyotyping is a technique in which the complete set of chromosomes are separated from a cell and the chromosomes are lined up in a **karyogram** . A diagrammatic representation of chromosomes is referred to **Idiogram** . The karyological studies are usually made during mitosis . It is much easier to obtain suitable mitotic cells.

The chromosomes in the eukaryotic cells has constant morphological features such as number, size , shape . The chromosomes are identified by other features such as the secondary constriction , arm ratio , and banding pattern . The summation of all such characters , which identify a set of chromosomes is called **karyotyping**.

In karyotyping , the foetal cells found in the amniotic fluid are cultured , in vitro, in a nutritive solution containing **phytohaemagglutinin** . Then the foetal cells are cultured with **Colchicine** . Colchicine stops mitosis at metaphase . When these cells are subjected to a hypotonic solution , the water diffuses into the cells and separates the chromosomes . The scattered chromosomes are then placed on a slide , stained and photographed under a microscope . Individual chromosomes are then cut off from the photograph and arranged as homologous pairs to form an **karyogram .**

33 . Give a short account on speciation .

Speciation :-

A species is a natural , biological unit . Among the various taxa , a species is not man made . It is a natural reality . The process of evolution operates at the species level only . Hence , in evolution much importance is given to the 'Origin of Species'. There are several types of species.

Allopatric species – Species occupying different geographical areas. eg : species of frogs in India and Srilanka . The two land areas are separated by the Gulf of Mannar.

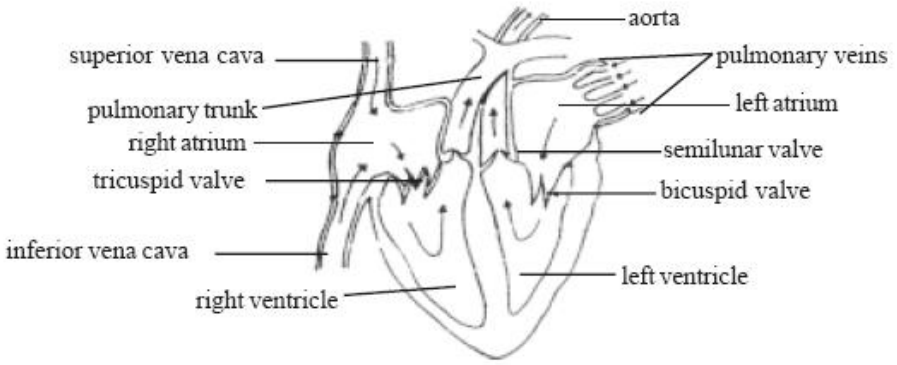
Sympatric species – closely related species living together in one common locality, yet maintain their species identity . eg : *Rana hexadactyla, R.tigrina and R.cyanophlictis* living together in a pond.

SECTION – D

34 . Explain the functioning of human heart .

1 . Functioning of Human heart

Heart is a pumping organ . The right atrium receives deoxygenated blood from different parts of the body through **inferior** and **superior vena cavae** and **pulmonary veins**. The left atrium receives the oxygenated blood from the lungs through **four pulmonary veins** . When the the atria contract , the blood is pumped into the corresponding ventricles . During ventricular contraction , the **pulmonary trunk** takes away the blood from the right ventricle to the lungs for oxygenation . An **aorta arising** from **t**he left ventricle , supplies oxygneated blood to the coronary arteries and the systemic circulation of the body.

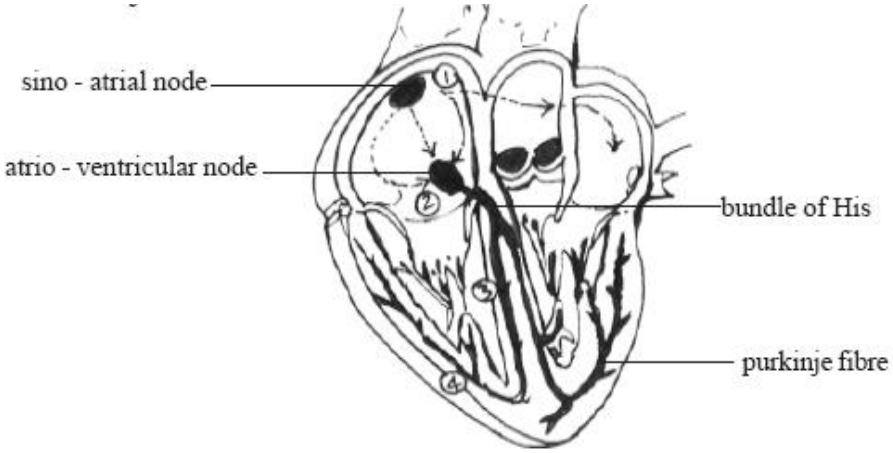


Functioning of human heart

The blood flow between atrium and ventricle is regulated by the **tricuspid valve** (right side) and **bicuspid** or **mitral valve** (left side) . In the pulmonary trunk and the aorta , the backward flow of blood is prevented by a set of **semilunar valves**.

2 . Origin and conduction of heart beat

The rhythmic contraction and relaxation of the heart chambers is maintained by **sino-atrial node** (SA node) , **atrio-ventricular node** (AV node) , **bundle of His** and **Purkinje fibres.**



Origin and conduction of heart beat

The SA node is situated in the right atrium . It is a small , flattened strip of muscle fibre , SA node produces action potential that can travel throughout the auricles. The velocity of conduction is 0.3m /sec . The AV node receives the electric impulse from SA node . Then it conducts the stimulus to bundle of His and Purkinje fibres . These myocardial fibres are found all over the wall of the ventricles . There is a delay in transmission of stimulus through the AV node and the fibrous system.

3 . Cardiac cycle

The sequential events occuring from the initiation of one heartbeat to the commencement of the next is called as one **cardiac cycle**. In this cycle , the contraction phase is called **systole** . The relaxation phase is the **diastole**.

Atrial systole : Blood is poured into the right atrium through superior and inferior vena cavae and coronary sinus . Simultaneously the left atrium receives blood from 4 plulmonary veins . There is a passive movement of nearly 70% of the blood . The remaining 30% is pumped into the ventricles by atrial contraction.

Ventricular filling : When the valves in between atria and ventricles open nearly two-third of the ventricle is filled . Remaining space gets filled up by atrial contraction.

Ventricular systole : When the action potential reaches the Purkinje fibrous system , it causes contraction of the ventricular wall . Thus a stong ventricular pressure results . Due to ventricular pressure , the semilunar valves open and the blood is pumped into respective arteries .

Ventricular diastole : Soon after the blood leaves the ventricles , there is a fall in the ventricular pressure. The semilunar valves close and the atrial valves open to begin the next cycle.

4 . Heart sound : The heart sound is caused due to the closure and opening of the valves . The heart sound can be felt by a stethescope . The first sound is louder (**lubb**) and is caused by the closure of atrio ventricular valves at the beginning of the ventricular systole . The second sound (**dubb**) is shorter and is caused by the closure of semilunar valves at the end of the ventricular systole. The heart beats at the rate of about 72-80 times per minute in adults.

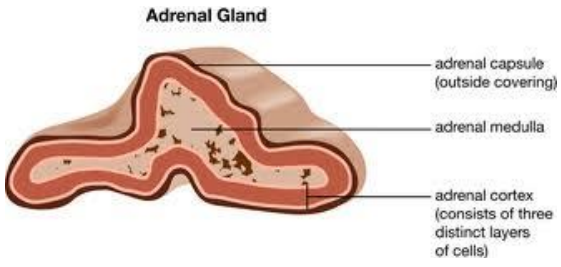
35 . Write an essay on the functions of adrenal secretions .

Adrenal gland

The **adrenal gland** or **supra renal gland** is composed of an outer **cortex** and an inner **medulla**. The adrenal cortex has three concentric zones .

1. A thin outer most layer, **Zona glomerulosa**,
2. A thick middle region, **Zona fasciculate** and
3. A thick inner layer, **Zona reticularis**.

In man, the cells of zona fasciculata and zona reticularis secrete glucocorticoids and a less amount of androgens and oestrogens. The cells of the zona glomerulosa secrete mineralocorticoids . All the adreno corticoid hormones are steroids.



Action of glucocorticoids

The major glucocorticoids are cortisone and certain closely related steroids. These hormones stimulate the production of glucose from non-carbohydrate sources such as fats and amino acids . Glucocorticoids also decrease glucose utilization by tissues . Glucocorticoids increase blood glucose level. Cortisone also acts as an anti-inflammatory agent.

Action of mineralocorticoids:

The major mineralocorticoid hormone is Aldosterone . Its most important effect is the resorption of sodium ions from the renal glomerular filtrate. Secondary effects are increasing chloride retention and decreasing potassium retention by the kidneys. The adrenal cortex plays a main role in stress tolerance.

Adrenal medulla:

The adrenal medulla differs from the cortex portion . The cells of the adrenal medulla are large ovoid and columnar in type . These cells are grouped into clumps around the blood vessels . The hormones produced by adrenal medulla are

1. **Adrenalin** or **epinephrin**e and
2. **Nor adrenalin** or **nor epinephrine**.

The various physiological and biochemical actions of **adrenalin** or **epinephrine** are the following:

1. Adrenalin stimulates constriction of blood vessels supplying the intestine , kidneys , viscera and skin . It also causes dilation of blood vessels supplying skeletal and heart muscle.
2. It increases the rate and amplitude of the heart beat.
3. It causes relaxation of the smooth muscles of the digestive tract and brings peristalsis to a halt
4. It causes relaxation of the bronchi , dilation of the pupil , closure of sphincters and increases sweating
5. It causes contraction of muscles associated with hair follicles and makes the hair "stand on end" and causes goose flesh .
6. It accelerates respiration and stimulates mental alertness
7. It stimulates the breakdown of glycogen to glucose , thereby increasing oxygen consumption and heat production.
8. Biochemically it releases the free fatty acids and increases blood glucose level.
9. Adrenalin prepares an individual during emergency or stress situations. Hence it is called the **fight**, **flight** and **fright hormone**.

Action of Nor adrenalin or Nor epinephrine:

Nor adrenalin has certain effects similar to that of adrenalin. For example, both the hormones dilate the coronary vessels . However , nor epinephrine cause vaso constriction in most organs . It increases both the systolic and diastolic blood pressures. It exerts a little effect upon carbohydrate metabolism and oxygen consumption.

36 . Fresh water crisis – Discuss .

Fresh water crisis and management

Clean , fresh water is essential for every human activity . The availability of water determines the location and activities of humans beings . Almost all agricultural operations need water.

Freshwater resources

Of the total water available on earth , only 3% is fresh water.

1. Glaciers, ice and snow : Of the 3% , about three – fourths is tied up in glaciers , ice caps and snow fields . They occur only at high altitudes or high latitudes.

2. Ground water : After glaciers , the next largest reservoir of fresh water is the ground water. Water held in the lower soil layers is known as **water table**. Porous- water bearing layers of sand , gravel and rock are called **aquifers**.

3. Lakes and Ponds : Lakes and Ponds hold standing fresh water year around . All the rivers and streams are minor component of total world water supply.

4. Wet lands : Bogs , swamps , wet meadows and marshes play a vital and minor role.

Freshwater shortages

At least one billion people of the world's population lack safe drinking water . Some countries (including island nations , Middle East countries) in the world have fresh water shortage .

Reasons for freshwater shortages

1. Natural forces

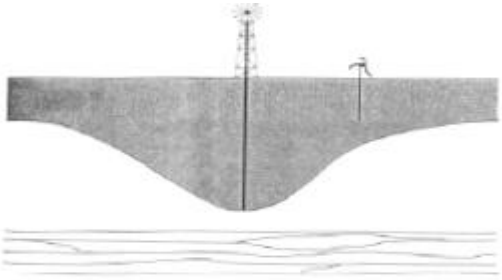
Deficits are caused by natural forces such as poor rain fall and hot winds .

2. Human causes

Include increased population , rapid urbanization , over grazing by cattle, improper cultivation methods , poor sewage systems , inadequate finances for providing infra structures.

3. Depleting ground water

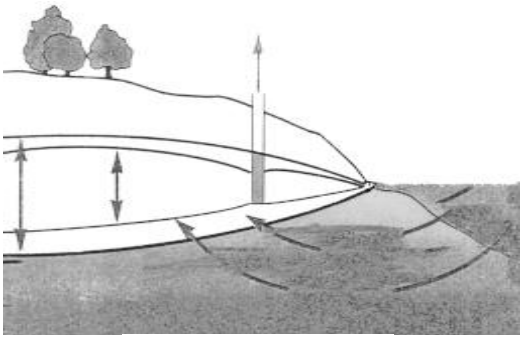
Ground water is used for agricultural and domestic use in most of the countries. Overuse of the ground water causes drying of wells , natural springs and disappearance of surface water sources such as wetlands , rivers and lakes.



Depletion of ground water

In many parts of the world, groundwater is being withdrawn from aquifers faster than natural recharge . A heavily pumped well can lower the ground water table and can deplete a whole aquifer . Many aquifers have slow recharge rates . If they were emptied once , it will take thousands of years to refill them .

4. Salt water intrusion



Salt water intrusion

Many parts of the world , saltwater intrudes into aquifers and affect the water table . It is due over usage of underground freshwater .

5. Loss of free flowing rivers

Loss of free flowing rivers is yet another cause for freshwater crisis.

6. Evaporations, leakage and siltation

It happens in freshwater lakes , ponds and dams .

Freshwater Management

The amount of water on the earth is fixed . We can do a little to make more water. There are several ways to increase local supplies.

a) Seeding clouds

Seeding clouds with **dry ice** or **potassium iodide particles** sometimes can initiate rainfall .

b) Desalination

Desalination of ocean water is a technology for increasing fresh water. The common methods of desalination are distillation and reverse osmosis . Although desalination is more expensive , it is followed in Dubai , Oman and Bahrain .

c) Dams, Reservoirs, Canals and Aqueducts

Water can be stored in dams and reservoirs and can transfer water from areas of excess to areas of deficit using canals, tunnels and underground pipes.

d) Watershed management

A series of small dams can hold water before it becomes a great flood . Small dams can be built with simple equipment and local labour .

e) Rain water harvesting

The activity of collecting rainwater directly or recharging it into ground to improve ground water storage in the aquifer is called **rain water harvesting**. By rainwater harvesting , water table depletion can be reduced and also sea water intrusion can be arrested .

The Government of Tamilnadu leads the nation in implementing rain water harvesting programme . It is mandatory for all houses and buildings in the State to install rain water harvesting facility.

f) Better agricultural practices

Sound farming and foresting practices can reduce run off . Retaining crop residues on fields reduces flooding . Minimizing ploughing and forest cutting on steep slopes protects watersheds .

g) Domestic conservation

We could save water using for domestic purposes . The use of washing machines, dish washers and low volume shower heads can reduce water loss.

h) Industrial conservation

Industries use more water for cooling of electric power plants . By installing dry cooling systems , this could be avoided . The industrial waste water may be treated, recycled and reused.

i) Saving water -an individual's role

As an individual , you can conserve water by the following methods.

- Take shorter showers .
- Don't wash car and two wheelers often .
- Don't allow tap run while washing hands or brushing your teeth .
- Use water conserving appliances : low –flow showers and low –flush toilets.
- Use recycled water for lawns , house plants and car washing .
- Check taps for leakages .

37 . Give a detailed account on cattle diseases .

Common diseases and control :

Cattle are subjected to a large number of diseases. Cattle in normal health appear bright , alert and active in their movements with a shiny coat. They also enjoy normal appetite and sleep . Cattle in ill health appear dull, restless and change posture frequently with a drop in milk yield.

Contagious diseases : The diseases which spread easily by various modes are called contagious diseases. These diseases may be bacterial or viral origin.

The bacterial diseases are **anthrax** , **haemorrhagic septicemia** , **mastitis** and **tuberculosis**.

The **viral diseases** are **cow pox** , **foot and mouth disease** and **rinderpest**.

1. Anthrax : Anthrax, a bacterial disease . It is due to β anthracis which causes sudden death in cattle.

Symptoms : High temperature (41-41.50c) , swelling of the neck , thorax and lumbar regions . Blood discharges from natural openings, the affected animal dies in 10 to 36 hrs.

Control : Vaccination with spore vaccine at the age of 6 month and then annually. Affected animals are to be segregated , contaminated place to be disinfected and the carcasses to be burried deep.

2. Cow pox is a viral disease attacking cows and buffaloes.

Symptoms : Retarded rumination , swelling of udder and teats , rise in temperature, eruptions on skin , udder and teats developing into vesicles leading loss of milk.

Prevention : Segregation of affected animal , giving sloppy food for swallowing and digestion , cleaning udder with warm disinfectant solution , treating lesions with antiseptic ointment . Cow shed should be kept clean.

3. External parasitic diseases : Common ectoparasites are flies, ticks , mites , fleas and lice. They suck the blood from cattle and become an irritant . They are also involved in transmitting bacterial, viral and protozoan diseases.

4. Internal parasitic diseases : Hook worm , round worm , tape worm and flukes are some of the intestinal parasites causing diarrahoea and dysentry .

Non-contagious diseases : The diseases which does not spread by external modes , but are caused by physiological or genetical means is known as non contagious diseases.

5 . Milk fever : Milk fever is common in high milk producing cows and buffaloes . It is due to inability of the animal to assimilate calcium from the feed , leading to demineralization in the bone . The serum Ca and P levels become low and the sugar level gets increased.

Symptoms : Staggering , loss of appetite , temperature becoming below normal , pulse rate becoming high , restlessness and become inactive.

Precaution and first aid : Feeding jaggery along with lime water , Cleaning the udder with warm cloth and preventing infection from the floor . Pumping clean air into the udder and massaging are other measures of treatment .

6. Constipation : Constipation is due to over eating of coarse fibrous roughages, inadequate intake of water and lack of exercise .

Symptoms : Lack of appetite , lack of rumination and dull appearance.

Precaution and first aid : The affected animals can be given wheat bran meal or rice gruel and succulent fodder . Giving plenty of drinking water with jiggery or salt , giving warm soap water enema and massaging the abdomen are the other measures of treatment.