

MODEL QUESTION PAPER – 1

BIO – ZOOLOGY

SECTION – A

Choose the correct answer :

1. According to ICMR , the daily requirement of protein for an average Indian is ...
 - a) 100 g / day
 - b) 100 g / kg body wt .
 - c) **1 g / kg body wt**
 - d) 1 g / day
2. Deficiency of vitamin D causes
 - a) Nyctalopia
 - b) Xerophthalmia
 - c) **Osteomalacia**
 - d) Pellagra
3. Myasthenia gravis is a / an
 - a) vitamin deficiency disease
 - b) infectious disease
 - c) kidney disorder
 - d) **autoimmune disease**
4. Stone formed in the urinary bladder can be disintegrated by a treatment called
 - a) **Lithotripsy**
 - b) ECG
 - c) EEG
 - d) CT scanning
5. The causative organism for cholera is
 - a) *Yersinia pestis*
 - b) ***Vibrio cholerae***
 - c) *Plasmodium vivax*
 - d) *Ascaris lumbricoides*
6. Identify the protozoan disease
 - a) **African sleeping sickness**
 - b) Measles
 - c) Cholera
 - d) Taeniasis
7. HIV infection causes
 - a) anaemia
 - b) diarrhoea
 - c) **immunity depression**
 - d) stroke
8. How will you name a graft , if an organ is transplanted from a cat to a dog ?
 - a) Isograft
 - b) Autograft
 - c) **Xenograft**
 - d) Allograft

9. The term ‘ super bugs ’ refers to

- a) Arthropods
- b) Insects
- c) Beetles
- d) **Genetically engineered bacteria**

10. Protein data banks are storehouses for

- a) storage of various types of proteins
- b) **information related to three dimensional structure of proteins**
- c) cryopreservation of proteins
- d) base pairing sequences

11. 95 % of all conventional energy is produced from

- a) **fossil fuel**
- b) sun light
- c) nuclear energy sources
- d) water power

12. Loss of freshwater sources due to salt water intrusion may be due to

- a) global warming
- b) sea level increase
- c) construction of dams
- d) **over use of ground freshwater resources**

13. ‘ Milk fever ’ in cows is normally due to.....

- a) **inability to assimilate calcium from the feed**
- b) starvation
- c) over feeding
- d) parasitic infestation

14. The scientific name for the common ‘ Viral ’ meen is

- a) ***Channa striatus***
- b) *Oreochromis mossambicus*
- c) *Chanos chanos*
- d) *Catla catla*

15. The blood cell count is made by using

- a) Glucometer
- b) Sphygmomanometer
- c) Haemoglobinometer
- d) **Haemocytometer**

16. Closely related species living together in one common locality and maintaining their species identity are termed as

- a) **Sympatric species**
- b) Allopatric species
- c) Sibling species
- d) Endangered species

SECTION – B

17. What is the role of water in our body ?

1. It is an essential constituent of all the cells of the body.
2. It serves as a transport medium for nutrients and excretory products.
3. It serves as a site for chemical reactions.
4. It is a valuable solvent for electrolytes, enzymes, hormones and vitamins.
5. It plays a vital role in the maintenance of body temperature.
6. It helps to maintain form and texture of tissues.

18. Mention the two surgical contraception methods adopted in birth control .

Surgical contraception, or sterilization, is an operation that makes a person infertile. This surgery can be carried out in men (vasectomy) and in women (tubectomy).

Vasectomy is the method of permanent birth control in male

Tubectomy is the method of permanent birth control in female

19 . How did Joseph Lister made the surgical treatments safer ?

On the basis on Pasteur’s evidence, Joseph Lister discovered a system for “antiseptic” surgery. This system prevents the surgical wound infection and other lethal complications.

20 . Define cell mediated immunity .

Cell - mediated immunity is killing of the infected target cell by **Cytotoxic T lymphocytes** (CTLs) and **Natural Killer** (NK) cells . This prevents the completion of life cycle of the pathogen and its growth . Cell-mediated immunity is also involved in killing of cancer cells.

21 . What could be the application of stem cell technique and cloning of cells in the future ?

Human cloning has its own ethical problems . But the principle could be used to grow new organs from the cloned stem cells . Such organ culture may solve transplantation problems, such as tissue incompatibility , tissue rejection , harmful immune reactions etc. Many human lives could be saved.

22. What are the clinical manifestation of the disease Thalassemia ?

The clinical manifestations of thalassemia include

- i) decrease in the bone marrow activity,
- ii) peripheral haemolysis and
- iii) splenomegaly (enlarged spleen) and hepatomegaly, (enlarged liver) etc.

The thalassemic children die at the age of seventeen.

23. Mention the languages that help in “ Bioinformatics ” .

The languages, which help in bioinformatics, are C, C++, JAVA, FORTRAN, LINUX , UNIX etc. Besides, knowledge of ORACLE database and Sybase are essential .

24. What is the application of Demography ?

The field of collecting, compiling and presenting information about population is called **demography**, and the people engaged in this work are named as **demographers**.

25. What are ‘ Bio – medical wastes ’ ? How are they disposed off ?

Human anatomical wastes, discarded medicines, toxic drugs, blood, pus, animal wastes, microbiological and biotechnological wastes etc are called **Bio-medical wastes**. The hazardous biomedical wastes are usually disposed off by means of **incineration**.

26. Suggest a situation in which a doctor might advice a CT scan .

When a person get head injury in an accident , a doctor might advice to take CT scan to assess the damage .

(Or)

When a person undergoes radiotherapy cancer treatment , a doctor might advice to take CT scan to determine how the tumor is responding to treatment.

27. What are the uses of Sphygmomanometer ?

- i) . Sphygmomanometer helps to estimate the state of blood circulation and the working of heart.
- ii) . Sphygmomanometer helps to diagnose hypertension (increased BP) and hypotension (reduction in BP).

28 . What are allopatric species ?

Species occupying different geographical areas are called **allopatric species** .
Ex : species of frogs in India and Sri Lanka. The two land areas are separated by the Gulf of Mannar.

SECTION – C

29 . Sleep is a state of unconsciousness – Substantiate your statement .

Sleep

Sleep is defined as a state of unconsciousness from which a person can be aroused by appropriate sensory or other stimuli.

Types of sleep :-

A person goes through two stages of sleep that alternate with each other. They are (1) Slow wave sleep and (2) REM sleep.

(1) **Slow wave sleep** :- Though this sleep is frequently called “dreamless sleep”, dreams and nightmares occur very often during this sleep. But , the process of consolidation of the dreams in memory does not occur. In this sleep the brain waves are very slow . This sleep is highly useful in decreasing blood pressure, respiratory rate and basal metabolic rate.

(2) **REM sleep (or) Rapid eye movement sleep** :- In a normal night sleep, REM sleep lasting 5-30 minutes . Usually it appears after every 90 minutes. It is associated with active dreaming . During REM sleep, the brain is quite active. But, the brain activity is not channeled in the proper direction The rate of heart beat and respiration usually become irregular.

Physiological effects of sleep :- Sleep restores both normal sensitivities of nervous system and “balance” . Due to good sleep , blood pressure falls , muscles fall into relaxed state , pulse rate decreases , skin vessels dilate and metabolic rate of the body falls by 10-30 %

30. “It may rather be difficult to get infected” – Discuss the statement on the basis of barriers providing innate immunity .

Innate Immunity (Non-specific): Innate immunity comprises natural defense mechanisms . This is the **first line of defense** in most animals . The pathogens that enter into the body , are quickly killed by innate immune system . Innate immunity consists of four types of barriers to prevent the entry of foreign agents into the body. .

1. Anatomical Barriers : The **skin** and the **mucous membrane** lining the respiratory , intestinal and reproductive passages are the **anatomical barriers** . These barriers block the entry of organisms into the body . Mucous material entraps foreign microorganisms. The ciliary movements of epithelial cells expel out micro-organisms from the body.

2. Physiological Barriers : Body temperature , pH and body secretions are the Physiological barriers . They prevent the growth of pathogenic micro-organisms .

For example,

- ❖ **Fever** response inhibits growth of many pathogens .
- ❖ **HCl** secretion in stomach kills ingested micro-organisms .
- ❖ **Lysozyme** present in **tears** and **saliva** digest bacterial cell walls .
- ❖ When infected with virus ,WBCs release anti viral proteins, called **interferons** . Interferons , make the body cells more resistant to viral infections .

3. Phagocytic Barriers : Phagocytosis is performed by phagocytes like **macrophages** and **neutrophils**. In response to pathogenic infections , the total count of leucocytes will increase sharply. The monocytes are liberated at the site of infection . These monocytes get converted into macrophages . Macrophages are large irregular-shaped cells that engulf microbes , viruses and cellular debris . These cells are provided with **bacteriolytic enzymes** and **free radicals** to destroy the pathogens.

4. Inflammatory Barriers : Usually an infection or tissue injury results in redness , swelling with pain and production of heat . The above phenomenon is known as **inflammatory response**. This response occurs due to release of chemical alarm signals, notably **histamine**, **serotonin** and **prostaglandins** , by the **damaged mast cells**. There is an **influx of phagocytic cells** into the affected area. The phagocytic cells inhibit and destroy the invading microorganisms..

31 . Enumerate the adaptations of pathogenic microbes .

Pathogenicity of Microorganisms:

Pathogenicity refers to the ability of microorganism to cause the disease in animals and humans . The Pathogenicity of the microbes is due to several adaptations.

1. Pathogens selectively attach to the external surfaces such as the skin and conjunctiva or the internal surfaces such as the mucus membranes of the respiratory, gastro – intestinal or urinogenital tracts.
2. They also penetrate the above body surfaces and gain access to the internal tissues.
3. Some pathogens may remain localized, growing near its point of entry into the body.
4. Some pathogens spread into different tissues or organs. This is called generalized infections.
5. Some other pathogens can grow within the cells , causing severe disturbances to normal physiological processes.
6. Yet another group , may grow extracellular and bring damage to the body tissues by releasing toxins.

32 . Describe how our knowledge of Embryology and Genetics are applied in the cloning technique .

Cloning is an experimental technique wherein , a group of genetically identical organisms is produced. Cloning of various animals has become possible due to knowledge gained in developmental biology and developmental genetics .

Differentiation : In the development of multicellular animals , the zygote is the progenitor cell of the future embryo. Many cells arise from the fertilized egg cell by mitotic divisions . These cells later become distinct cell types differing in form and function. This process is called differentiation.

In 1950s , R.Briggs and T.King developed a technique called **nuclear transplantation**. The nuclei of frog egg cells are enucleated and replaced with nuclei of early embryo cells of the same animal. The recipient egg cells developed into normal tadpoles and frogs . The investigators produced a number of genetically identical individuals with the above technique . Cells of early embryo are capable of producing the whole organisms . Hence they are said to be totipotent.

However, experiments by J. Gurdon revealed that transplantation of nuclei from older embryos and tadpoles affected the developmental potential of the recipient egg cells . They gives rise to development of specific tissues or organs. It is learnt that cells of older embryos switch over from totipotent state to pluripotent state.

33 . What is Hardy – Weinberg law ? Discuss its importance in population genetics .

Hardy-Weinberg Law (Population genetics)

According to this law ‘**the relative frequencies of various kinds of genes in a large and randomly mating sexual population tend to remain constant from generation to generation in the absence of mutation, selection and gene flow or migration.**

A population comprising of sexually interbreeding organisms is termed as the **genetic population** or **Mendelian population**. A genetic population may be defined as “ A community of similar individuals living within a limited circumscribed area at a given time and capable of interbreeding”. The genes of all the individuals of such a Mendelian population will constitute the gene pool. **A gene pool comprises a diverse forms of a gene combining and recombining by the process of sexual reproduction.**

The **gene frequency** refers to **the proportion of an allele in the gene pool as compared with other alleles at the same locus**. If the frequency of gene ‘A’ is represented by ‘p’ and that of gene ‘a’ by ‘q’ and at gene equilibrium condition their total frequency is represented by 1, then at equilibrium

$$p+q = 1 \quad (\text{or}) \quad p = 1-q \quad (\text{or}) \quad q = 1 - p$$

A law to understand population genetics was provided by G.H. Hardy and W.Weinberg in 1908. The law proposed by them is known as **Hardy-Weinberg’s law**. It is the foundation of population genetics and modern evolutionary theory.

This law concerns with a population not undergoing any evolutionary change. The normal mendelian genic frequencies are maintained under certain conditions only. If such conditions are not followed, the gene frequency will change leading to deviations and cause variations. These variation will be the sources for future evolution.

SECTION – D

34. Enumerate the process of digestion of food in the gastro-intestinal tract.**DIGESTION IN THE STOMACH**

The stomach is a wide muscular chamber. The stomach volume during feeding may increase upto 1.5 lit. The contractile action of stomach will produce peristaltic waves. The initial wave influences the closure of **pyloric sphincter**.

The inner wall of the stomach contains nearly 40 million gastric glands. These glands produce gastric juice. The chief cells secrete enzymes and parietal cells (**Oxyntic cells**) produce HCl.

The enzymes of gastric juice are **pepsin** and **renin**. The inactive **pepsinogen** is converted into active pepsin by HCl. Pepsin hydrolyses the proteins into polypeptide chains and peptones.



Renin acts on soluble milk protein **caesinogen** and converts into insoluble **casein**. In the presence of Ca ions casein is precipitated as insoluble calcium – casein compound (curd).

Repeated peristaltic waves in the stomach soften the food. The food leaves the stomach in the form of **chyme** at periodical intervals.

DIGESTION IN THE SMALL INTESTINE

The small intestine is 5 – 7 meters long and divided into three regions namely **duodenum**, **jejunum** and **ileum**.

The food is propelled down into the duodenum as chyme. In the small intestine, the food is mixed with three juices namely **bile juice**, **pancreatic juice** and **intestinal juice**.

1. Bile juice : – It is a brownish green , alkaline secretion of liver . It is stored in the gall bladder and poured into the duodenum via bile duct . The bile juice contains water , mucus , inorganic salts , cholesterol and **bile salts** . During emulsification the bile salts convert bigger fat particles into smaller fat globules called the **chilomicrons** .

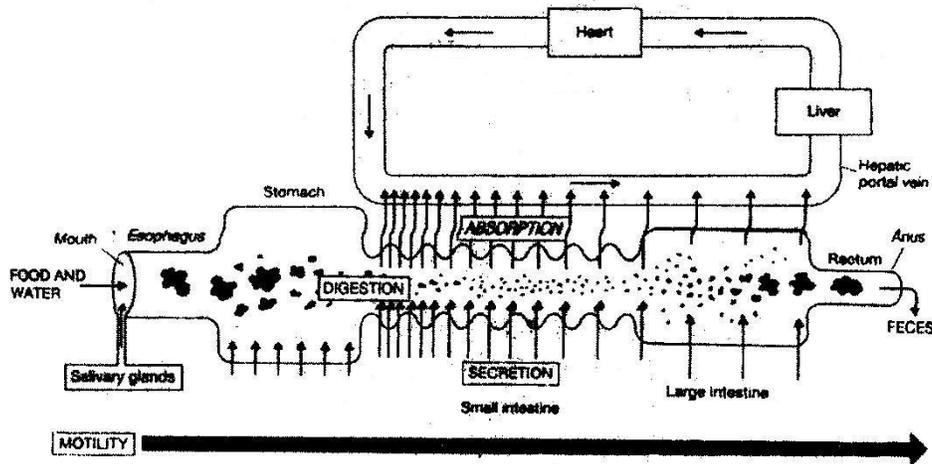


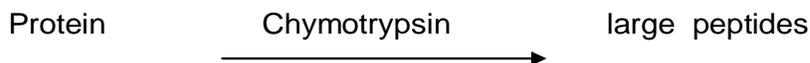
Fig.1.3 Process of digestion .

2. Pancreatic juice :– It is an alkaline fluid (pH 7 to 8) . It is transported to the duodenum through pancreatic duct . It contain water , mineral salts and enzymes like trypsin , chymotrypsin , carboxypeptidase pancreatic amylase , pancreatic lipase , and nuclease .

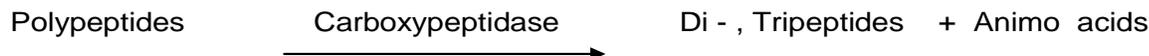
Trypsin hydrolyses proteins into polypeptides and peptones .



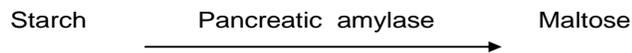
Chymotrypsin hydrolyses peptide bonds of phenylalanine , tyrosine or tryptophan and results in large peptides .



Carboxypeptidase attacks the peptide bonds at the carboxy end of the polypeptide chain resulting in dipeptides , tripeptides and amino acids .



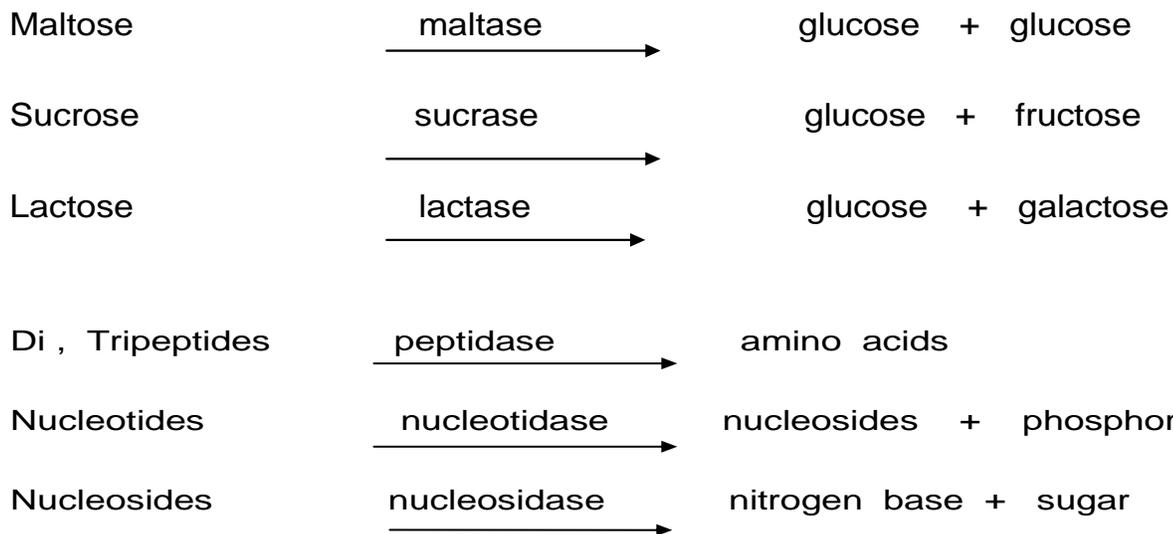
The **pancreatic amylase** converts starch into maltose .



The **pancreatic lipase** hydrolyses the emulsified fat into fatty acid and glycerol .



3. Intestinal juice :- (Succus entericus) It contains many enzymes like maltase , sucrase , lactase , peptidase , nucleotidase and nucleosidase . The actions of the enzymes are as follows .



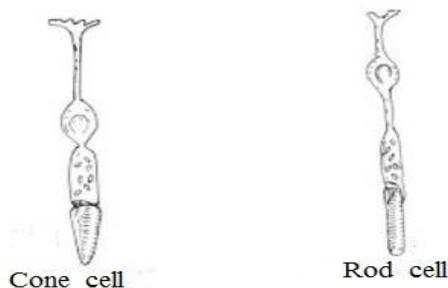
35 . Describe the functioning of eye as a visual receptor . Add a note on eye care .

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.

Eye care

Eye is an important organ and it is to be taken care of.

1. Eye examination should be periodically done to determine the cause of visual disturbance.
2. Foreign particles are very common and it may penetrate in the eye ball. So care should be taken while removing the dust to avoid damage.
3. The retina should be periodically examined to assess conditions such as retinopathy for hypertension and diabetic patients.
4. Self medication should be avoided. A doctor should be consulted immediately, if there is any sudden pain or blurry vision.

36. 'Global warming' is the direct result of 'Green house effect'. Discuss the statement. What related problems do we foresee.

A) Global warming :

Global warming refers to an increase in the earth's average temperature. The average temperature of earth is about 59 ° F (15 ° C). During the last century this average has risen by about 1 ° F. But at present, it is raising rapidly due to human activities. By the year 2100, it is believed that the rise would be between 2.5 and 10.4 ° F. This will cause dramatic changes in sea level, rainfall patterns and serious impacts on plants, wildlife and humans.

B) Green house gases and Green house effect :-

Certain gases in the atmosphere trap more energy from the sun and leading to the rise in earth's temperature, is known as **Green house effect**. These gases absorb and reflect infra-red waves radiated by earth. They conserve heat as the glass in a green house does. Hence these gases are known as **green house gases**.

eg – water vapour, carbon dioxide, nitrous oxide and methane

Normally all life on earth depends on this green house effect. If it does not exist, the earth would be covered with ice from pole to pole. But if the greenhouse effect becomes strong, it could make the earth warmer and cause problems for humans, plants and animals.

C) Types of Greenhouse Gases :-

In the environment, greenhouse gases occur (i) naturally or (ii) from human activities.

Carbon dioxide is the most abundant greenhouse gas. It reaches the atmosphere due to volcanic eruptions, respiration of animals, burning and decay of organic matter such as plants. Normally carbon-dioxide is used by plants in photosynthesis and also absorbed into ocean water. But due to human activities like burning of fossil fuels, solid wastes, wood products and deforestation, the carbon dioxide level increases in the atmosphere. There were about 281 CO₂ molecules per million molecules of air (i.e., parts per million or ppm) in 1750. Today atmospheric carbon-dioxide concentration is 368 ppm, a 31% increase.

Methane traps 20 times more heat than carbon-dioxide . It is emitted during the production and transport of coal , natural gas and oil . It is also emitted from rotting organic waste , by the cows as a byproduct of digestion . Since 1750 , the amount of methane in the atmosphere becomes more than doubled.

Nitrous Oxide traps 300 times more heat than carbon-dioxide . Nitrous oxide is released from burning fossil fuels and ploughing farm soils . Since 1750 its level increased by 17%.

Hydrocarbons formed from the manufacture of foams and **chloro-fluorocarbons** used as coolants in refrigerators are the other gases responsible for global warming.

By 2000, scientists discovered a new gas called **trifluoromethyl sulphur penta fluoride**. It traps more heat than all other greenhouse gases. But the industrial source of this gas is not yet identified.

D) Effects of Global warming :-

1. Due to global warming , the Glacier ice will melt and causing rise in sea level . In the 21st century sea level will rise from 9 to 88 cm . Such a rise will submerge many parts of countries.
2. Seasons will be longer in some areas.
3. The warmed world will be generally more humid and it will increase the rainfall.
4. Storms are expected to be more frequent and intense.
5. Some regions of the world would become dry.
6. Wind blows will be harder and in different patterns. Hurricane would be more severer.
7. Weather patterns would be less predicable .
8. Crops and forests may be affected by insects and plant diseases .
9. Animals will tend to migrate toward the poles and higher elevations.
10. Some types of forests may disappear.
11. More people will get sick or die from heat stress.
12. Tropical diseases such as malaria, dengue fever and yellow fever will spread to other parts of the world.

E) Efforts to control Global warming:-

There are two major ways to control global warming:

1. Keeping the carbon-dioxide out of the atmosphere , a strategy called **carbon sequestration**.
2. Reducing the production of green house gases.

Carbon sequestration :-

The simple technique is to preserve trees and plants more. Trees, take up carbon-dioxide, break it down in photosynthesis and store carbon in new wood. Carbon-dioxide can also be sequestered directly into deep ocean water or into oil wells from which it cannot escape.

Usage of alternate fuels such as nuclear energy, solar power, wind and hydrogen fuel which emit no greenhouse gases are being considered.

37. Write an essay on cattle wealth of India.

Important cattle breeds of India and

Among mammals, cattles belong to the genus *Bos*. At present 26 breeds of cattle and 6 breeds of buffaloes are found in India. Cattles are classified under three groups. They are **Dairy breeds**, **Dual purpose breeds** and **Draught breeds**.

I. Milch breeds (or) Dairy breeds

The cows are high milk yielders with extended lactation periods. The bullocks are of poor draught qualities. These cattle are well built with strong limbs. e.g Deoni, Gir, Sindhi and Sahiwal.

1. Sindhi (Red Sindhi, Red Karachi) :

Origin and distribution : The home of this breed is Karachi and Hyderabad.

Distinguishing characters : Medium size and compact body. Thick horns with blunt points. They have intelligent facial expression. They are deep dark red in colour. The udder is large with medium sized teats. The animals are docile and quiet. Bullocks are suited for road and field work. Sindhi cattles are highly resistant to heat and ticks. These are the most economical milk producers among the dairy breeds of India.

Milk production :- Yields 5,443 kg per lactation period.

2. Gir (Kathiawarhi, Surti) :-

Origin and distribution : The breed originated from the Gir forest of South Kathiawar. Impure breeds are found in Baroda and some parts of Maharashtra.

Distinguishing characters : Most of these cows have spotted skin. The body is well built. The pure breed has a majestic appearance. Ears are long like a leaf. Tail is long and whip like. Udder is large with matching teats. Bullocks are heavy, powerful and good for draught.

Milk Production : Gir cows are good milk yielders of 3,715 Kg per lactation period.

II. Dual purpose breeds :

This breed of cattle are meant for both milk yield and draught works. The cows are good milkers and the bullocks are useful in draught works like ploughing, transport, cart pulling etc.

eg : Hariana and Ongole.

1. Ongole : Nellore

Origin and distribution :- Ongole tract of Andhra Pradesh, Guntur, Venukonda taluks of Nellore.

Distinguishing characteristics : This breed is a larger form. The male weighs about 700Kg and female weighs about 400 Kg. Ongole breed is white in colour with grey marking. Hump is well developed. The horns are stumpy. Bullocks are powerful and suitable for cart and road work but are not fast.

Milk Productions : Cows are good yielders of 1700 kg to 3500kg per lactation.

III. Draught breeds :

These breeds are exclusively meant for pulling carts, ploughing fields etc.. The bulls are used for draught works. The cows are poor milkers.

eg : Amrithamahal, Kangayam, Malvi, Hallikar etc.

1. Kangayam (Kanganad , Kongu) :-

Origin and distribution: This breed originated from Kangayam divisions of Coimbatore district in Tamilnadu. It is also found in Udumalpet, Palladam, Pollachi and in other parts of South India.

Distinguishing characters : The cattle of this breed are of moderate size . The body colour is white or grey with black markings. The horns are strong and curved . Neck is shorter and thick . The ears are smaller and pointed . The udder is medium sized with small teats . The bulls are excellent type for hard work.

Milk Production : The cows are poor milkers, yielding about 666 kg per lactation.

2. Hallikar

Origin and distribution : Commonly found in Karnataka. Hassan and Tumkur regions of Karnataka are the home places of this breed.

Distinguishing characters : Body is dark grey or black in colour The animals are of medium size. The head has a prominent furrow in the middle. The horns are long and then curved with sharp point . The hump is moderately developed . The udder is medium sized with small teats. The bullocks are used for ploughing , transport and other field works.

Milk Production : The cows are poor milkers.



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 graft
 - 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) Chlorofluorocarbons
- b) Hydrochlorofluorocarbons
- c) **Chloro and Hydro chlorofluorocarbons**
- 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 Lamarck ?

- 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 **balloon 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 ?

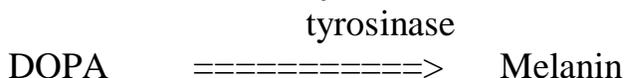
Interferons are the anti viral proteins released by certain WBCs at the time of viral infection . Interferons make body cells more resistant to viral infections .

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.



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 preceding 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 amounts 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.

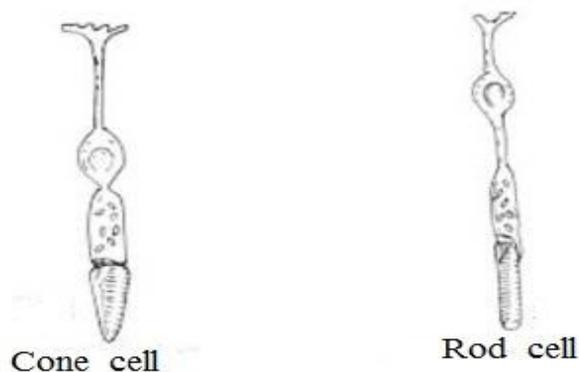
SECTION – C

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.

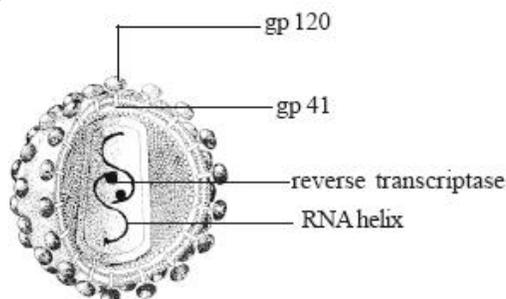


Fig. 2.11. Structure of HIV

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.

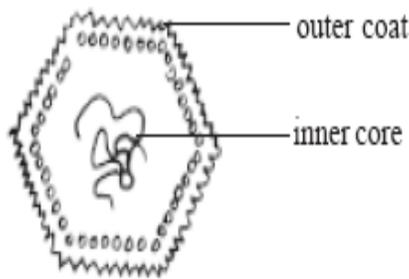
31 . Briefly describe the structure of virus .

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

T₂-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.

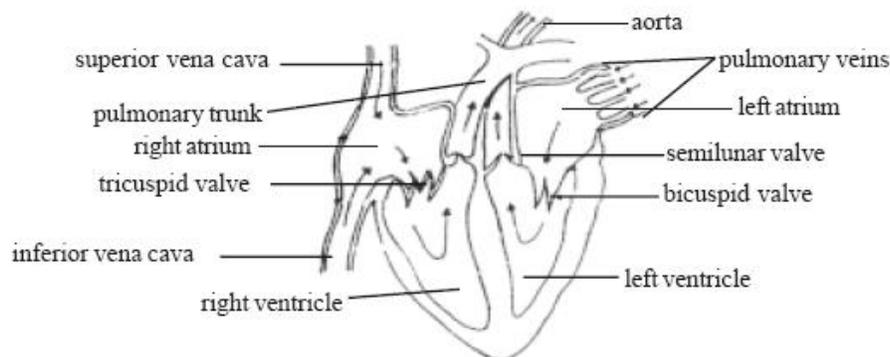
Sympatric species – closely related species living together in one common locality, yet maintain their species identity. eg : *Rana hexadactyla*, *R.tigrina* and *R.cyanophlictis* living together in a pond.

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 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 the left ventricle, supplies oxygenated blood to the coronary arteries and the systemic circulation of the body.

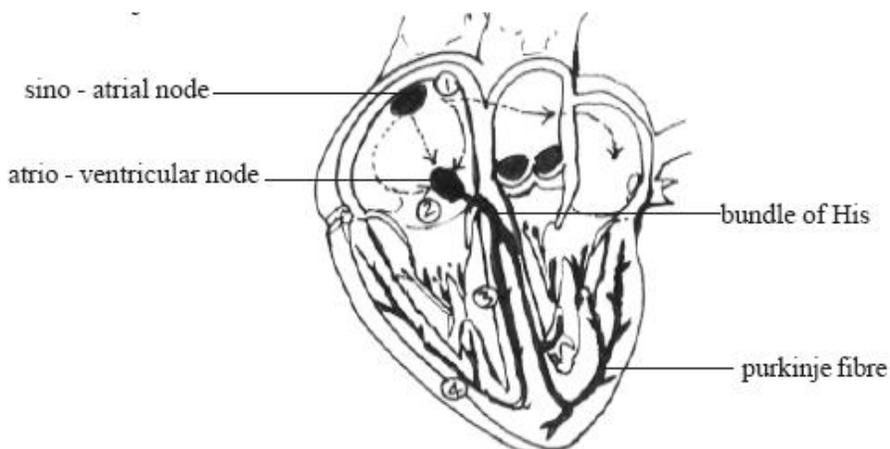


Functioning of human heart

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 occurring 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 pulmonary 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 strong 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 stethoscope . 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.

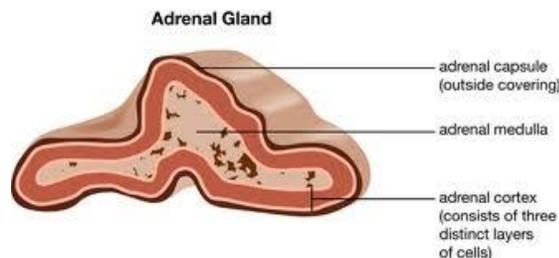
35 . Write an essay on the functions of adrenal secretions .

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 **epinephrine** 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

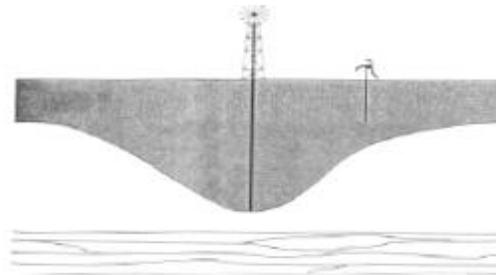
Deficits are caused by natural forces such as poor rain fall and hot winds .

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

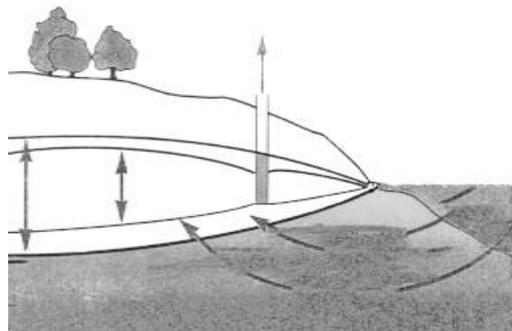
Ground water is used for agricultural and domestic use in most of the countries. Overuse of the ground water causes drying of wells , natural springs and disappearance of surface water sources such as wetlands , rivers and lakes.



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 buried 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 diarrhoea and dysentery .

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.



9. To introduce a gene into a cell, pores can be made on the plasma membrane by method
- a) **electroporation**
 - b) electrification
 - c) vector
 - d) gene gun
10. Proteins are made up of
- a) fatty acids
 - b) carbohydrates
 - c) **amino acids**
 - d) DNA
11. According to Thomas Malthus the pattern of population growth is in a
- a) negative rate
 - b) **geometric rate**
 - c) arithmetic rate
 - d) steady state rate
12. Dual purpose cows means
- a) **cows meant for milk and field works**
 - b) cows meant for milk and drought resistance
 - c) cows meant for drought resistance and field works
 - d) cows meant for meat and milk
13. Which endoscopic technique is used to detect the defects if any in the vagina or cervix
- a) **Colposcopy**
 - b) Cystoscopy
 - c) Thoracoscopy
 - d) Bronchoscopy
14. Which one of the following is the Chinese carp
- a) Kendai
 - b) Mrigala
 - c) **Common carp**
 - d) Murrels
15. The hatching period of chick's egg is
- a) 10 days
 - b) **21 – 22 days**
 - c) 15 – 20 days
 - d) 25 – 30 days
16. The fossil form of horse is
- a) Equus
 - b) Eohippus
 - c) Archeopterix
 - d) All the above

SECTION – B

17. Define BMI .

The degree of obesity is assessed by the Body Mass Index (BMI) . It is calculated as weight in Kg. divided by the square of height in meters . Normal BMI range for adults is 19 – 25 .

18. What is pulse rate ?

The rhythmic expansion and contraction of an artery as blood is pumped through it is known as pulse . The number of expansion per minute is termed as pulse rate . The pulse rate usually corresponds to the heart rate

19. Name any two antibiotics .

Some notable antibiotics are Ampicillin , Streptomycin , Tetracyclin and Erythromycin etc.

20. What is meant by diploid cell strain ?

Diploid cell strains are derived by primary cell cultures from a specific tissues like lung or kidney which is of embryonic origin.

21. Differentiate Autograft from Allograft.

Autograft : The tissue of the original donor is grafted back into the same donor. For example, skin graft from thigh to face in case of burnt individuals (plastic surgery) .

Allograft : (Homograft). Graft between allogenic individuals (ie.,members of the same species but of different genetic constitution. For example, kidney transplanted from one human to another.

22. What is differentiation ?

In the development of multicellular animals , a large number of cells are produced from the fertilized egg cell (the zygote) by mitotic divisions .These cells later become distinct cell types (tissues) differing in form and function. This process is called **differentiation**.

23 . What is sequenator ?

The sequence of bases in the DNA fragments can be identified by chemical / biochemical methods . Nowadays , the sequence of hundreds of bases in the DNA can be read by an automated sequencing machines called **sequenator** . Then the DNA sequence data are stored in a computer accessible form.

24 . What is geothermal energy ?

Geothermal energy is a significant source of electricity in several island nations of Indian oceans and the Pacific regions . Geothermal plants make use of naturally heated steam drawn to the surface through a series of boreholes .

25 . What is meant by seeding of clouds?

Seeding water laden clouds with **dry ice** or **potassium iodide particles** to initiate rain fall is called seeding of clouds .

26 . How will you identify a healthy cattle?

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.

27 . What is the use of haemocytometer ?

Haemocytometer is usually used to count the red cells , platelets and eosinophils . Now-a-days it is also used for counting cells of bacteria , yeast or algae.

28 . What is polymorphism ?

Polymorphism is the “*the existence , in a natural population , of two or more alleles in frequencies too large to be explained by recurrent mutation*”.

Thus a polymorphic population will have several alleles of a gene . The varied alleles are favoured and maintained in the population by genetical mechanisms.

SECTION – C

29. If chicken pox viruses enter into the body of a man, what would the reaction within the body?

If the chicken pox viruses enter into the body, they are quickly killed by the innate immune system. This is the **first line of defence** in most animals. When the body is infected with a virus, certain cells like WBC release anti-viral proteins, called **interferons**. Interferons make the cells resistant to viral infections.

If the innate immunity fails to destroy the viruses, the acquired immunity (Specific defence mechanisms) will be activated. It requires several days to be activated. Acquired immunity employs two major groups of cells: (a) **antigen presenting cells** and (b) **lymphocytes**.

The antigen (Virus) is processed by **antigen presenting cells (APC)**, like macrophages, B lymphocytes and dendritic cells. The processed antigen is presented on the surface of these cells. A subgroup of T cells called **T helper cells**, interact with the presented antigen and become activated. The activated T helper cells then activate **B lymphocytes**, and a subgroup of T cells called **cytotoxic lymphocytes (CTLs)**.

The activated cytotoxic lymphocytes (CTLs) involve in cell-mediated immunity. It is specific to a target cell, which has been infected with viruses. The activated cytotoxic lymphocytes kill virus-infected cells and some tumour cells of the body by creating **perforin-lined** pores in the plasma membrane of the target cells. Water enters into the target cell and then the cell swells and bursts. This prevents the completion of the life cycle of the virus and its growth.

30. Explain the mechanism of reflex action.

Sometimes, as the brain, the spinal cord can effect motor initiation and bring about an effect. This activity is known as reflex action.

Reflex action

Reflex action is the spontaneously involuntary response caused due to stimulation of receptor organ.

- E.g. 1. The quick closure of eye lid when some object touches the eyelashes.
2. The sudden withdrawal of hand when the hand touches hot pan.

A reflex action is an involuntary process. The anatomical basis of reflex action is the reflex arc. It is a nerve chain between receptor organ and effector organ. The reflex arc has the following route.

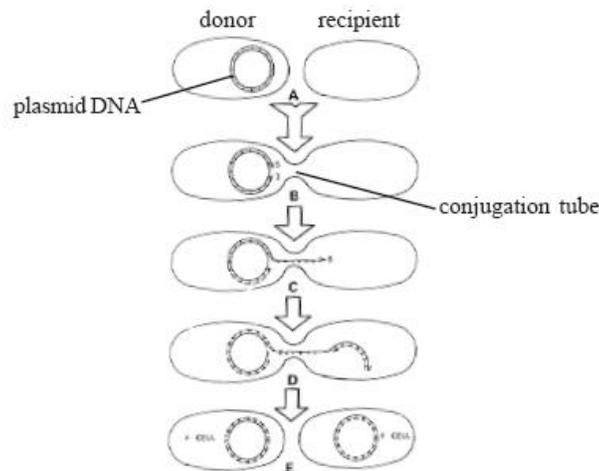
Sensory organ → sensory or afferent neuron → grey matter of the spinal cord → intermediary or relay neuron → efferent or motor neuron → effector organ.

31. Write short notes on bacterial genetics.

Bacterial Genetics :

The bacterial cells have a single circular DNA. It is not associated with proteins. Like the eukaryotic genes, the bacterial genes involve in replication, phenotype expression, mutation and genetic recombination etc. In bacteria, the genetic recombination results from three types of gene transfer viz., conjugation, transduction and transformation.

Conjugation involves the transfer of some DNA from one bacterial cell to another. In this, large segments of the chromosomes or the entire chromosome may be transferred.



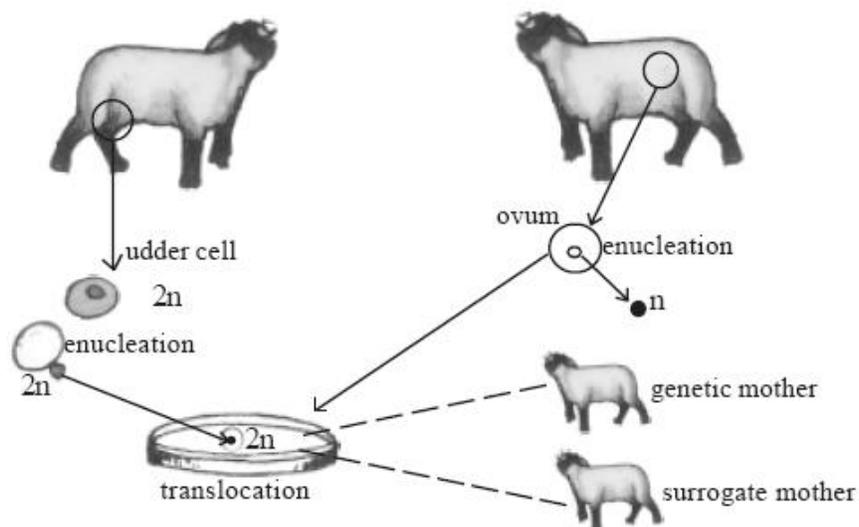
Bacterial conjugation

In **Bacterial transformation** the free or naked DNA is transferred from one bacterial cell to another. It was discovered by Griffith in 1928. The transforming principle was identified as DNA by Avery Macleod and Mc Carthy in 1944.

In **transduction**, a bacteriophage acts as a vector. It transfers a portion of DNA from one bacterium (donor) to another (recipient). If all fragments of bacterial DNA are transduced by bacteriophage, the process is called **Generalized transduction**. On the contrary, if a few bacterial genes are transduced, it is called **specialized transduction**.

32. Explain the Ian Wilmut experiment to produce clones.

Dr. Ian Wilmut has produced a cloned sheep called **Dolly** by **nuclear transplantation** method. He took the udder cell from a donor sheep, The udder cell has diploid number of chromosomes ($2n$). An egg cell (n) was also removed from a donor sheep. The egg cell cannot grow into a new sheep because it has haploid number of chromosomes. The udder cell also cannot grow into a new sheep because it is not a reproductive cell. So the udder cell nucleus ($2n$) was removed. Similarly the egg cell nucleus (n) was also removed. Then the nucleus of the udder cell was injected into the enucleated egg cell.



Mechanism of cloning of sheep

After the nuclear transplantation, the egg cell gets diploid set of chromosomes ($2n$) without fertilization. Then the egg was transplanted back into the uterus of the sheep from which it was removed. The egg can also be transplanted to a new surrogate mother for development. The egg cell developed into a sheep (Dolly). This cloned sheep is genetically identical to the donor sheep, which donated the diploid nucleus and not the sheep which donated the egg cell.

33 . Briefly explain Sewal Wright's genetic drift .

Genetic drift or Sewall Wright effect.

Genetic drift theory was developed by Sewall Wright in 1930 . It is concerned with the gene frequency of a reproducing small population . In a small population not all the alleles of that species may be present . In such a small population , the frequency of a character that has little adaptive value may increase. Thus the genetic drift may remain a significant factor in the origin of new species on islands and other isolated populations. Further, continual mating may decrease the number of heterozygotes and increase the number of homozygotes . However the small population may develop characters different from the main population . Such deviations may lead to speciation or formation of a new species.

When a group of individuals , due to genetic drift , become founders of a new population the phenomenon is termed as 'founder principle'. The new population has genotype frequencies different from the parent population.

Sometimes genotypic frequencies may get changed in an isolated small population. When the population regains its original size , the members of the small population may have diverged genetically from the original parental population. Hence interbreeding between members of small and larger populations may not be possible. The small population might have evolved into a new species. This type of genetic drift is referred to as **bottleneck effect** or **Sewall Wright effect** .

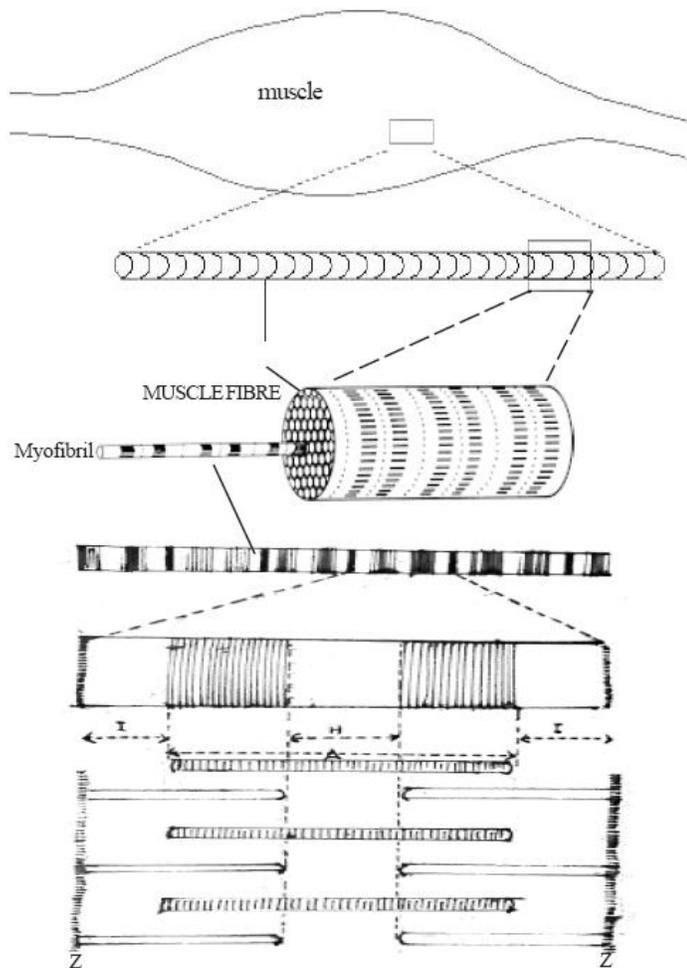
SECTION – D

34 . Describe the structure of a striated muscle with the help of diagram .

Structure of a skeletal muscle:

A striated muscle is composed of many muscle fibres arranged in bundles. Each muscle fibre is 10 to 100 microns in diameter . They are 1 to 20 mm in length . Each fibre is surrounded by a membrane, called the **sarcolemma**.

Each muscle fibres is made up of 4 to 20 thread-like **myofibrils** . They are parallel to each other. The myofibrils are 1 to 3 micron in diameter. In between the myofibrils, the sarcoplasm is present . A small segment of the myofibril is called as the **sarcomere**.



Ultra structure of muscle fibre

Structure of sarcomere :

Under a microscope, a sarcomere consists of alternative dense (**A band**) and light bands (**I band**). The central region of the A band is known as the "**H Zone**". The 'I band' is bisected by the "**Z line**". Thus each sarcomere includes repeating units between two Z lines in linear order as Z line, I band, A band, I band and next Z line.

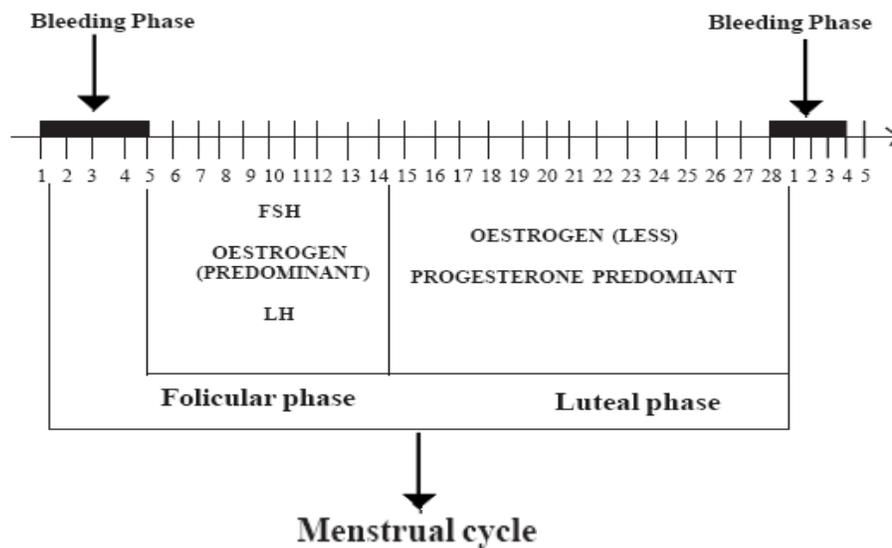
The striations in the muscle fibres are due to the arrangement of 2 types of protein filaments. 'A band' contains a set of thick (100 Å diameter) protein filaments called **myosin**. The second set of thin (50 Å diameter) filaments extend partly in 'I band' and partly in 'A band'. These filaments are formed of a substance called **Actin**.

Myosin, actin, tropomyosin and troponin are the four major proteins involved in muscular contraction. The energy for muscle action is provided by ATP molecules.

35 . Write an essay on menstrual cycle .**Menstrual cycle**

The menstrual cycle is the characteristic feature of female reproductive system in human . The rhythmical series of changes that occur in the sex organs for about 28 days throughout the reproductive life of women from puberty to menopause (except during times of pregnancy) is called the **menstrual cycle**.

The monthly flow of blood from the genital canal is called menstruation or menses. The menstrual cycle is usually divided into three phases on the basis of changes taking place in the ovary and uterine endometrium.

**1 . The follicular phase or Proliferative phase (5th day - 14th day)**

The follicular phase is initiated by the follicle stimulating hormone (FSH) of anterior pituitary . During this phase , a primary graffian follicle begins to enlarge . While it is growing , the follicle secretes **oestrogen** and smaller quantities of progesterone into the blood . Under the effects of oestrogen , the endometrium starts regenerating from the basal portion . By the 14th day , the graffian follicle has matured and pushed up against the ovary surface . The secretion of FSH ceases at the end of follicular phase.

2 . The Luteal phase or Premenstrual phase (15th day - 28th day)

The luteal phase begins at day 15 . Under the influence of Leutenizing hormone (LH) , rupture of graffian follicle and release of ovum (ovulation) occurs.

After ovulation, the empty follicle is transformed into a transitory endocrine gland called **corpus luteum**. The corpus luteum secretes a large quantity of **progesterone** and smaller amount of oestrogen into the blood. The progesterone prepares the endometrium to receive the fertilized ovum., The progesterone hormone is highly essential to maintain pregnancy and to prevent the contraction of uterus. If there is no fertilization, the corpus luteum degenerates and is reabsorbed by the ovary at the end of luteal phase.

3 . The menstrual phase (1st - 5th day)

The decline in progesterone and oestrogen initiates shedding of the endometrium and severe bleeding called menses or menstruation. During this phase, all the extra layers are sloughed off along with unfertilized egg. At the termination of menstruation, the corpus luteum is converted into a scar tissue called **corpus albicans**.

36 . Management of hazardous wastes – Discuss .

Management of hazardous wastes

Hazardous wastes may remain dangerous for thousands of years. The hazardous waste include radioactive refuse, metallic compounds, organic solvents, acid asbestos, organic cyanides, pathological hospital wastes, disposable medical equipments and tools.

The following methods are adopted for the disposal of hazardous wastes.

1. Land fills : Military related liquid and high level radioactive waste materials are stored in deep underground land fills. The land fill is capped with impervious clay to prevent infiltration and percolation of water through the fill. Fill bottom is provided with drainage system to remove any leakage that occurs. Monitoring the wells provides a final check.

2. Deep – well injection : It involves drilling a well into dry, porous material below groundwater. Hazardous waste liquids are pumped into the well. They are soaked into the porous material and made to remain isolated. However fractures in the impermeable layer may permit the injected wastes to escape and contaminate ground water.

3. Surface impoundments : This method is used to dispose large amounts of water carrying relatively small amounts of chemical wastes. Liquid wastes are drained into the surface impoundments (ponds). Solid wastes settle and accumulate at the bottom while water evaporates. If the pond bottom is well sealed and if evaporation equals input, wastes may be stored in the impoundment indefinitely.

4. Incineration : Human anatomical wastes, discarded medicines, toxic drugs , blood , pus, animal wastes, microbiological and biotechnological wastes etc are called **Biomedical wastes** . These hazardous biomedical wastes are usually disposed off by means of incineration.

5. Bioremediation : This is another rapidly developing clean up technology. ***Cleaning the environment with biological options such as microbes and plants is called bioremediation.*** Some bacteria and other microorganisms are able to degrade or detoxify the wastes such as heavy metals . Many plant materials are successfully used as adsorbents for xenobiotics (phytoremediation). Certain plants such as *Gibberella fusarium* are able to breakdown cyanide and reduce it to a non-toxic form . Genetically Engineered Micro-organisms (GEMS) are currently used to remove the hazardous radionuclides and heavy metals such as mercury, chromium, cadmium etc. The *Pseudomonas* bacteria, nicknamed as ‘super-bug’ are capable of degrading a variety of toxic compounds and also degrade oil.

37. Describe the important steps involved in rearing of chickens .

Stages involved in rearing of chickens / Poultry farming : Selection of eggs, incubation and hatching of eggs , brooding or care of new borns , housing of poultry , feeding of poultry are the important steps in rearing of chickens.

1. Selection of eggs:-

Eggs meant for hatching and rearing must be selected very carefully. The following points should be considered during selection of eggs.

(1) The egg should be fertile (2) Over-sized and small sized eggs should not be selected instead medium sized should be preferred (3) Dark-brown shelled eggs hatch earlier than light-brown shelled eggs (4) Freshly laid eggs are preferred for rearing.

2. Incubation and hatching:

The fertilized hen’s egg undergoes development during incubation and hatching processes. The fully formed bird emerges out of egg after a hatching period of 21-22 days. During this period the egg must obtain optimum temperature, humidity and ventilation etc. The maintenance of eggs in optimum condition till hatching is called **incubation**.

The incubation is of two types namely **natural incubation** and **artificial incubation**. In the natural incubation, the eggs are subjected to the care of mother. Only a limited number of eggs can be incubated by a mother hen. In artificial incubation the eggs are maintained in a chamber (incubator). In artificial incubation more number of eggs can be incubated than natural incubation.

3. Brooding :-

Brooding is the care and management of young chickens for four to six weeks immediately after hatching. Brooding also has the natural and artificial methods. In the natural method, day-old chickens are left to the care of mother. In the artificial method temperature controlled **artificial brooder** is used.

Factors involved in brooding :

Temperature :- The hatched chicks are kept inside the incubator for about 36 hours and then transferred to artificial brooder. The optimum temperature is 33⁰ C during the first 3 days. During the subsequent weeks, the temperature is reduced by 3⁰ C each week till it reaches 21⁰ C.

Ventilation :- Fresh air movement is important for good health and proper growth of the chicks. Poor ventilation results in the accumulation of carbon monoxide, ammonia and water vapour which may lead to microbial infection.

Floor space :- Minimum 500sq.cm of floor space per chickens is to be provided. Crowding of chickens leads to poor growth and induces cannibalistic tendencies amongst the birds.

Litter :- The floor of the brood house is layered by beds of hay, rice husk or saw dust and this is called **litter**. The litter bed should be 5 to 7.5 cm thick and it must be kept dry.

Light :- The brood house must be well ventilated. Evenly distributed sunlight promotes proper growth of the birds and formation of vitamin D.

4. Housing of poultry :-

Open sided poultry is popular in our country. The housing to poultry is to protect them from sun, rain and predators and to provide comfort. Poultry house should be well ventilated. It should be kept cool in summer and warm in winter. The floor of the poultry house should be moisture-proof, rat proof, free from cracks and easily cleanable.

5 . Poultry feeding :-

Feeding of poultry bird is an important part of rearing. The diet of chickens must contain adequate amount of water, carbohydrates, proteins, fats, vitamins and minerals. The food stuffs such as maize, barley, wheat , oil cake , rice etc are to be given in standard requirements.

