MODEL QUESTION PAPER – 1

BIO – ZOOLOGY

SECTION – A

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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 consoli-dation 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 barrier**s . 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 Physio-logical 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 .

Pathogenecity of Microorganisms:

Pathogenecity refers to the ability of microorganism to cause the disease in animals and humans . The Pathogenecity 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

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

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 .

$$\text{Protein} \xrightarrow{\text{pepsin}} \text{polypeptide + peptones}$$

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** .
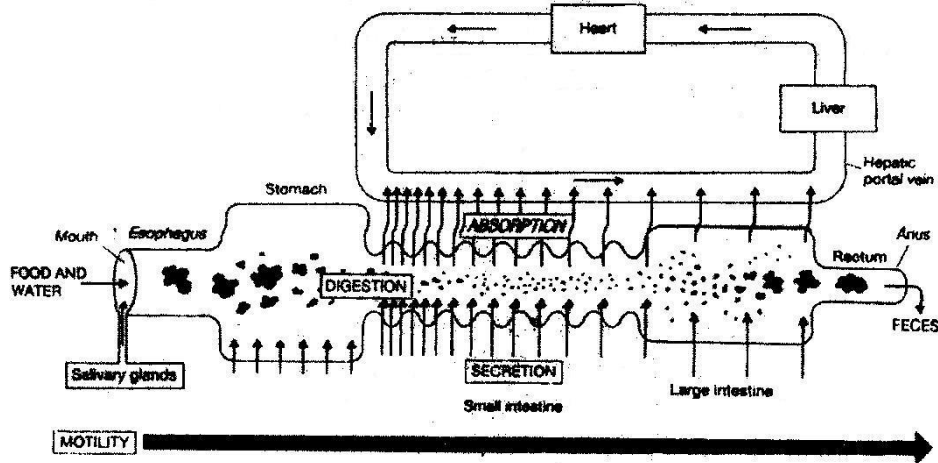

Fig.1.3 Process of digestion

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 <u>polypeptides</u> and <u>peptones</u> .

Protein $\xrightarrow{\text{trypsin}}$ Polypeptide + Peptones

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

Protein $\xrightarrow{\text{Chymotrypsin}}$ large peptides
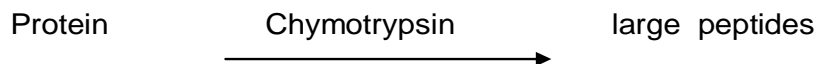
Carboxypeptidase attacks the peptide bonds at the carboxy end of the polypeptide chain resulting in <u>dipeptides</u> , <u>tripeptides</u> and <u>amino acids</u> .
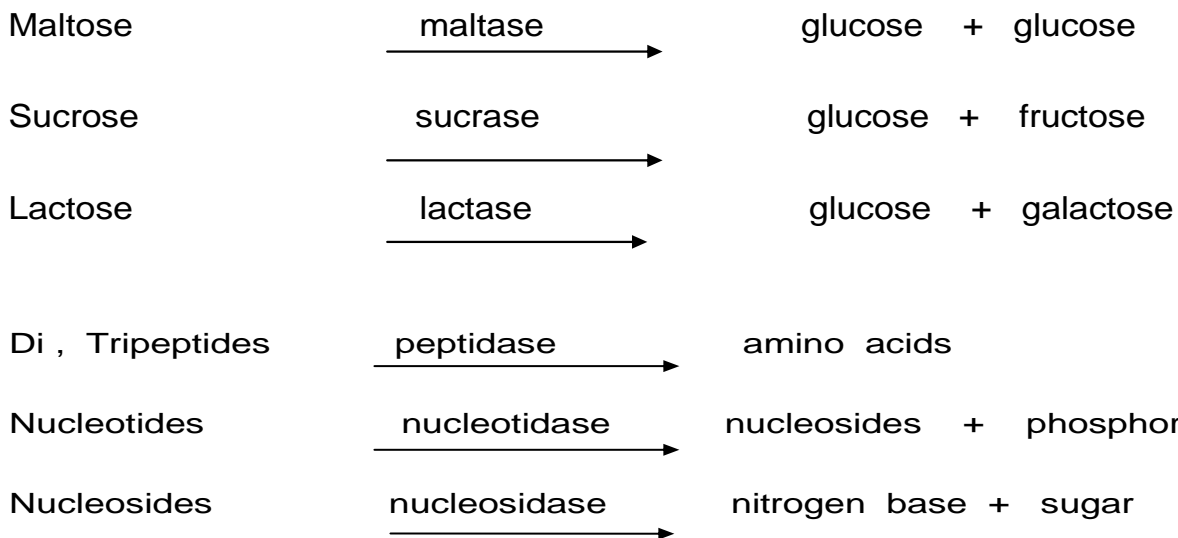
Polypeptides $\xrightarrow{\text{Carboxypeptidase}}$ Di - , Tripeptides + Animo acids
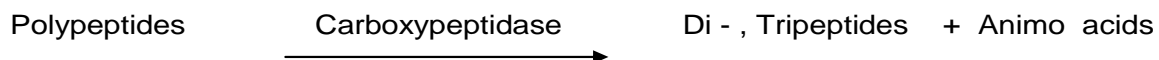
The **pancreatic amylase** converts starch into <u>maltose</u> .

Starch   Pancreatic amylase   →   Maltose
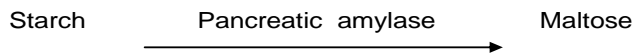
The **pancreatic lipase** hydrolyses the emulsified fat into <u>fatty acid</u> and <u>glycerol</u> .

Fat   Pancreatic lipase   →   Fatty acids + Glycerol
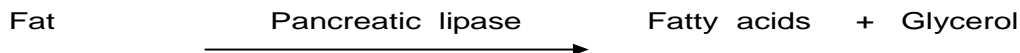
3 . <u>Intestinal juice</u> :– (Succus entericus) It contains many enzymes like maltase , sucrase , lactase , peptidase , nucleotidase and nucleosidase . The actions of the enzymes are as follows .

Maltose   maltase   →   glucose + glucose

Sucrose   sucrase   →   glucose + fructose

Lactose   lactase   →   glucose + galactose

Di , Tripeptides   peptidase   →   amino acids

Nucleotides   nucleotidase   →   nucleosides + phosphoric acid

Nucleosides   nucleosidase   →   nitrogen base + sugar

35 . Describe the functioning of eye as a visual receptor . Add a not 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.**

Cone cell   Rod cell
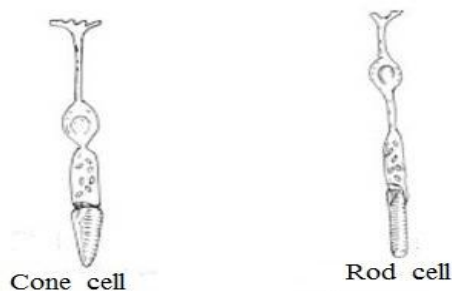
Cones also contain rhodopsin pigments made up of **Retinene** , combined with a protein called **Photopsin** . Three pigments are found in man , each responding to different primary colors namely red , green and blue . . In bright light , maximum perception of colors is at the **fovea** region of the 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 of 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) <u>naturally</u> or (ii) <u>from human activities.</u>

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 CO_2 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 prediclable .
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 sequestrated 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 Maharastra.

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 Andra 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 Udumalapet, 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.

Distinguising 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.