

Previous IPE
SOLVED PAPERS

MARCH-2019 (TS)

PREVIOUS PAPERS**IPE: MARCH-2019(TS)****Time : 3 Hours****SR.ZOOLOGY****Max.Marks : 60****SECTION-A****I. Answer ALL the following VSAQ:****10 × 2 = 20**

1. What is Chyme?
2. What are the Columns of Bertin?
3. Name the keystone bone of the cranium. Where is it located?
4. How do Rods and Cones of human eye differ from each other chemically and functionally?
5. What are the measures one has to take to prevent contracting STDS?
6. What is "Capacitation" of sperms?
7. What are multiple alleles?
8. Distinguish between a Drone and Worker in a honeybee colony.
9. What is Turner's syndrome?
10. Mention any four fish by - products.

SECTION-B**II. Answer any SIX of the following SAQs:****6 × 4 = 24**

11. Describe the process of digestion of proteins in the stomach.
12. Describe disorders of Respiratory system.
13. Draw a neat labelled diagram of pelvic girdle
14. Write a note on Addison's disease and Cushing's syndrome
15. Explain the mechanism by which HIV multiplies and leads to AIDS.
16. Discuss the role of different patterns of selections in evolution.
17. Explain Darwin's theory of Natural Selection with industrial melanism as an experimental proof.
18. Write about the procedure involved in MRI.

SECTION-C**III. Answer any TWO of the following LAQs:****2 × 8 = 16**

19. Describe the Excretory system of man giving the structure of a Nephron.
20. Describe female reproductive system of a woman with the help of a labelled diagram.
21. Describe chromosomal theory of sex determination.

ipe TS MARCH-2019

SOLUTIONS

SECTION-A

1. What is Chyme?

- A:** 1) **Chyme:** It is the **acidic semi digested fluid food** formed in the stomach.
2) It is formed by the **churning movements** of the stomach muscles.
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2. What are the Columns of Bertin?

- A:** **Columns of Bertin:** These are the projections of the cortex into the medulla that separate the renal pyramids in the human kidney.
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3. Name the keystone bone of the cranium. Where is it located?

- A:** 1) Sphenoid bone is the keystone bone present in the base of cranium.
2) It articulates with most of cranial bones.
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4. How do rods and cones of human eye differ from each other chemically and functionally?

- A:** Rods and cones are photoreceptor cells. [TS MAR-19]
- 1) **Rods** contain a purplish-red protein called Rhodopsin or visual purple. Rhodopsin needs Vitamin A and opsin for its formation. Rods are necessary for vision in dim light (scotopic vision)
- 2) **Cones** contain iodopsin. It is important for day light vision and colour vision. There are three types of cones for the red, blue and green colours. Equal stimulus produce white colours. Different levels of stimuli produce different colours.
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5. What are the measures one has to take to prevent contracting STDs?

- A:** **Measures to prevent STDs:** [AP 17,18][TS 19]
- 1) Avoiding sex with unknown partner or multiple partners.
2) Using condoms compulsorily during intercourse.
3) Consulting qualified doctor for early detection of STDs.
4) Getting complete treatment in case of infection.
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6. What is "Capacitation" of sperms?

- A:** **Capacitation of sperm** refers to the physiological changes that the spermatozoa be able to penetrate and fertilize an egg.

7. What are multiple alleles?

- A:** 1) If a gene has more than two alleles then they are said to be multiple alleles.
2) **Ex:** In humans ABO blood groups are the best example for multiple allelism.

8. Distinguish between a Drone and Worker in a honeybee colony.

A:	Drone bee	Worker bee
	1) A drone is a male honey bee. 2) Drone donot have stringers. 3) Drone's life span is short. 4) Drone is bigger than worker bee but smaller than queen bee. 5) Its primary role is to mate with fertile queen.	1) A worker bee is a sterile female bee. 2) Worker bees have stringers. 3) They live for two to three months. 4) Worker bees are smaller than drones 5) They secrete wax, build hexagonal cells of hive, collect nectar, manufacture and store honey, gather pollen and make propolis.

9. What is Turner's syndrome?

- A:** 1) **Turner's syndrome** is a genetic disorder caused by monosomy in 23rd pair (only one chromosomes). The Karyotype is 45, X. Barr bodies are absent.
2) Symptoms are short stature, gonadial dysgenesis, webbed neck, flat chest with widely spaced nipples.

10. Mention any four fish by - products.

A: Fish by-products:

- 1) Shark liver and cod liver oil.
- 2) Omega 3 fatty acids in saldines and salmon.
- 3) Fish guano - fertiliser from waste fish.
- 4) Isinglass - prepared from air bladder and used in clarification of wines.

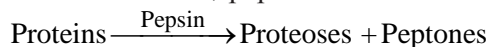
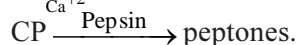
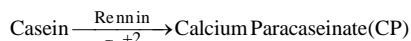
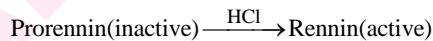
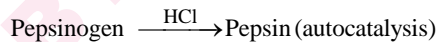
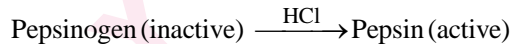
SECTION-B

11. Describe the process of digestion of proteins in the stomach.

A: Digestion process of proteins:

- 1) The digestion of proteins **begins in the stomach** and **ends in the small intestine**.
- 2) When the food enters into the **stomach**, **gastric juice** is **secreted**.
- 3) Food mixed with gastric juice forms a semi fluid mass called **Chyme**.
- 4) This gastric juice contains **HCl**, **pepsinogen**, rennin and **mucus**.
- 5) **HCl** provides the **optimal** pH (1.8) for the action of Pepsin.
- 6) Pepsin is a **protein digesting enzyme**.
- 7) HCl converts **inactive** pepsinogen into **active pepsin**.
- 8) The activated pepsin converts **proteins** into **proteoses and peptones**.
- 9) In infants, HCl activates the inactive prorennin into active enzyme rennin.
- 10) **Rennin** acts on **casein** (milk protein) in the presence of Calcium ions and converts it into Calcium Paracaseionate (CP).
- 11) Then pepsin acts on CP and converts it into peptones.
- 12) The entire process takes about **4 to 5 hours** in the stomach.

Bio chemical reactions



12. Describe disorders of Respiratory system.

A: Disorders of Respiratory system:

A) Asthma B) Bronchitis C) Emphysema D) Pneumonia E) Occupational disorders

A) Asthma: Asthma is a difficulty in breathing caused due to **inflammation of bronchi** and **bronchioles**. The symptoms are wheezing, coughing, chest tightness and shortness of breath.

B) Bronchitis: It is the **inflammation of bronchi** with increased production of mucus.

The symptoms are chronic cough with thick mucus and phlem.

C) Emphysema: It is a type of chronic obstructive pulmonary disease. It is a progressive disease. The **lining of alveoli** are **damaged beyond repair**. Smoking is the major cause of the disease.

D) Pneumonia: It is the infection of lungs by streptococcus pneumonia.

Further infection takes place by virus, fungi, protozoans and mycoplasmas.

The symptoms are inflammation of lungs, accumulation of watery mucus in alveoli .

Asthma, bronchitis and emphysema are chronic obstructive pulmonary diseases.

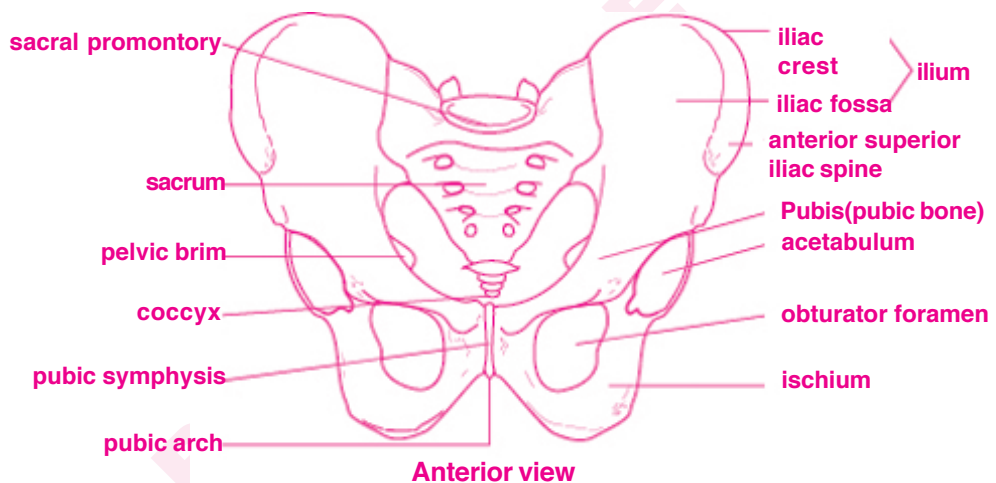
E) Occupational disorders:

Long time exposure to certain industries causes various types of diseases. They are

- 1) **Asbestosis** to workers in Asbestos industry.
- 2) **Silicosis** to mining workers and workers in quarries.
- 3) **Siderosis** to workers of steel and iron industries.
- 4) **Black-lung disease** to workers in coal mines.

13. Draw a neat labelled diagram of pelvic girdle.

A:



14. Write a note on Addison's disease and Cushing's syndrome

A: 1) Addison's disease: Addison's disease is due to hyposecretion of glucocorticoids by adrenal cortex. The symptoms are loss of weight, muscle weakness, fatigue, reduced blood pressure and darkening of skin colour. They cannot respond to stress.

2) Cushing's syndrome: It is due to hypersecretion of glucocorticoids.

The symptoms are Spindle like arms and legs, Round moon face,

Buffalo hump on the back, Pendulous abdomen, Poor wound healing,

Hyper glycemina, Rapid gain of weight.

15. Explain the mechanism by which HIV multiplies and leads to AIDS.**A: HIV-AIDS:**

- 1) HIV means **Human Immuno deficiency Virus**.
- 2) It transmits by sexual contact, blood transfusion, sharing needles of infected patients and from infected mother to child.
- 3) **Mechanism:** After entering into the host, HIV enters TH cells, macrophages and dendritic cells.
- 4) The **ssRNA** synthesis a 'DNA strand', complementary to 'viral RNA strand' using reverse transcriptase.
- 5) The enzyme also helps in the formation of second DNA strand complementary to the first.
- 6) Then a double stranded viral DNA is formed.
- 7) The viral DNA is incorporated into host DNA by the enzyme integrase.
- 8) The incorporated DNA is called Provirus.
- 9) The provirus transcribes RNA that can be translated viral proteins (Particles).
- 10) The viral particles are assembled to form HIV.
- 11) The infected human cells act as HIV generating factories.
- 12) There the T_H cells are infected and destroyed.
- 13) The time between the first infection and appearance of symptoms may be few months to 10 years.
- 14) **Symptoms:** Aids patient experiences bouts of fever, diarrhoea and loss of weight.

16. Discuss the role of different patterns of selections in evolution.**A:** Natural selection as an evolutionary force is of three types.

- 1) **Stabilising selection:** It operates in a stable environment. In this type the organisms having average phenotype are preserved. The individuals with extreme phenotypes are eliminated. Thus the stabilising selection does not promote evolutionary change. It maintains the phenotypic stability over generations.

Ex: In England weights of new born babies were studied.

Greater mortality was found in babies whose weight was either greater or lesser than average weight of 8 pounds.

- 2) **Directional selection:** This selection operates in a gradually changing environment. It constantly eliminates individuals from one end. The average values are constantly shift to the other favourable end.

Ex 1 : In Giraffes the average value is the length of the neck towards long neck.

Stabilising selection takes over the directional selection when the phenotype coincides the new environment (Head reaching the top of the trees).

Ex 2: Resistance to DDT by mosquito: The mosquitos which are resistant to DDT survived and produced DDT resistant mosquito. The other non resistant type eliminated.

3) **Disruptive selection:** This selection operates when homogenous environment changes into heterogeneous type. The organisms with extreme phenotype survive and grow into separate populations. It is also called adaptive radiation.

Ex: Dark and grey peppered moths. Darwin's finches with different shaped beaks, sunflower populations of California which formed in dry land and Wet land types. Where there is no inter breeding it is certain that new species have evolved.

17. Explain Darwin's theory of Natural Selection with industrial melanism as an experimental proof.

- A:**
- 1) Darwin's theory of natural selection explains how evolution might have occurred in nature.
 - 2) Natural selection of darker forms in response to industrial pollution is known as 'industrial melanism'.
 - 3) Peppered moth is taken as a scientific example to explain this.
 - 4) These moths were available in two colours grey and black.
 - 5) Grey moths were abundant before industrial revolution in all over England.
 - 6) Pollution from industries in the form of soot turned barks of trees into black.
 - 7) So grey moths were easily identified and were more predated by birds.
 - 8) Thus grey moths decreased in number, black moths increased in the population.

18. Write about the procedure involved in MRI.

A: MRI: MRI stands for Magnetic Resonance Imaging.

- 1) MRI is a diagnostic radiology technique.
- 2) MRI does not use ionizing radiation as in X-rays. So is a very safe procedure.
- 3) It produces detailed pictures of organs, soft tissues, bones and any other structure of the body.
- 4) MRI scanner is a **giant circular magnetic tube**.
- 5) The patient is placed on a movable bed that moves into the magnetic ring.
- 6) Human body is mainly composed water which contains protons.
- 7) The magnet creates a strong magnetic field. Body protons align with the direction of magnetic field. A second radio frequency electromagnetic field turned on for a brief period.
- 8) The protons of different parts of body release different energy, which can be detected by MRI scanners.
- 9) Accordingly there is a contrast between images of different tissue based on their water content.
- 10) The information received is processed by a computer and an image is generated.
- 11) The images are transferred to a photographic film.
- 12) Sometimes radio contrast agents like gadolinium are used to increase accuracy.

SECTION-C

19. Describe the excretory system of man, giving the structure of a nephron.

A: 1) Human excretory system: It consists of 4 parts. [AP 19][TS 15,19]

1) A pair of kidneys 2) A pair of ureters 3) Urinary bladder 4) Urethra.

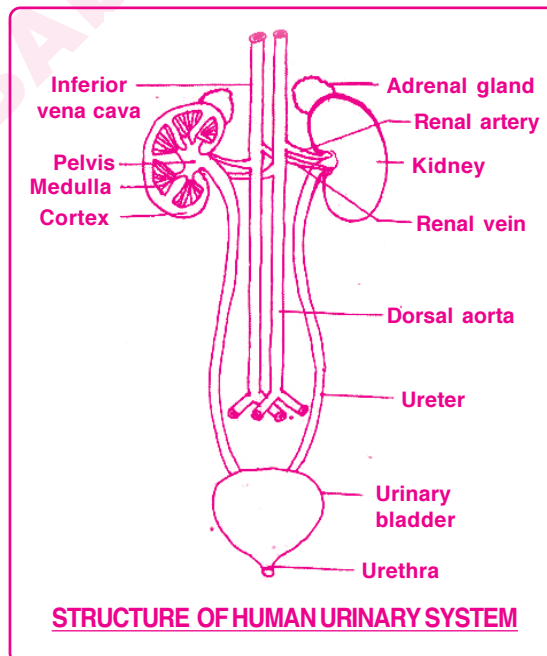
1) Kidneys:

- (i) These are **reddish brown, retroperitoneal bean shaped** organs.
- (ii) These are located on either side of vertebral column at the level of anterior lumbar vertebrae.
- (iii) Outer surface of kidney is **convex** and inner surface is **concave** with a deep notch called hilum.
- (iv) Internally, kidney consists of two regions, the **outer cortex** and **inner medulla**.
- (v) The cortex contains the malpighian capsules, proximal and distal convoluted tubules of nephrons.
- (vi) The medulla is divided into multiple cone shaped masses of tissue called **renal pyramids**.
- (vii) Renal columns (Columns of Bertini) separate the renal pyramids. These are the projections of cortex into the medulla.

2) Ureters: There are two ureters which are **slender whitish** tubes emerging from the pelvis of the kidneys. They run downwards and open into the urinary bladder.

3) Urinary bladder: It is a median **storage sac**, situated in the lower abdominal cavity.

4) Urethra: The **neck of the bladder** leads into the urethra. It has an internal urethral sphincter and external urethral sphincter.



II) Structure of Nephron: It consists of 2 parts. (1) Bowman's capsule (2) Renal tubule.

1) Bowman's capsule:

- (i) It is present in cortex.
- (ii) It is a double walled cup.
- (iii) The inner wall of the Bowman's capsule has certain unique cells called podocytes which wrap around each capillary.
- (iv) The podocytes are arranged in an intricate manner so as to leave some minute spaces called filtration slits.
- (v) The Bowman's capsule encloses a tuft of capillaries called glomerulus.
- (vi) The glomerulus and **inner** wall of Bowman's capsule together form a sieve.
- (vii) Blood enters the glomerulus through **afferent arteriole** and leaves by **efferent arteriole**.

2) Renal tubule: It consists of 3 segments (a) PCT (b) Henle's loop (c) DCT

(a) PCT (Proximal Convoluted Tubule):

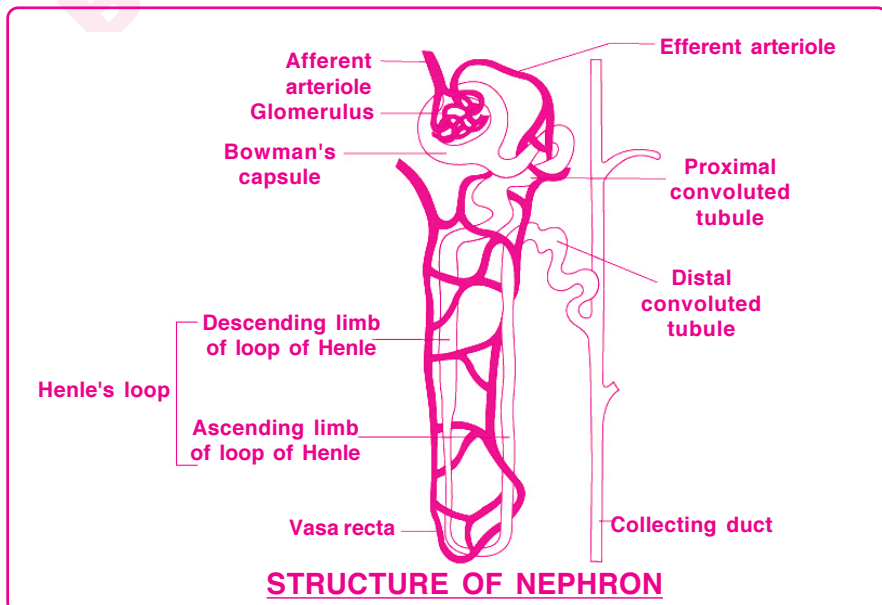
- (i) It is present in cortex.
- (ii) It is **wide and highly coiled**.
- (iii) It is lined by **simple cuboidal epithelium** with **brush border**.

(b) Henle's loop :

- (i) It is present in medulla.
- (ii) It is hairpin shaped. It has descending and ascending limbs.
- (iii) The **proximal part** of the ascending limb is **thin** and the **distal part is thick**.
- (iv) The thick ascending limb continues into the DCT.

(c) Distal Convoluted Tubule (DCT):

- (i) It is present in cortex.
- (ii) The DCT present in cortex continues as the 'initial collecting duct' in the cortex.
- (iii) Some initial collecting ducts combine to form a straight collecting duct, which passes through the medullary pyramid.
- (iv) In the medulla, the tubes of each pyramid join and form the **duct of Bellini**, which finally opens on the tip of the renal papilla.



20. Describe female reproductive system of a woman with the help of a labelled diagram.

A: **FEMALE REPRODUCTIVE SYSTEM:** [AP 15, 19,22] [TS 15, 17,19,20]

Female Reproductive System consists of 6 parts.

I) Ovaries II) Fallopian tubes III) Uterus IV) Vagina V) Vulva VI) Accessory glands

I) Ovaries:

- (1) Ovaries are the **primary female sex organs** that produce female gametes (ova) and also several steroid hormones.
- (2) A pair of ovaries are located one on each side of the **lower abdomen**.
- (3) Ovary is connected with the wall of abdominal cavity by a **fold of peritoneum called mesovarium**.
- (4) Ovaries are covered by **germinal (ovarian) epithelium** and **tunica albuginea**.
- (5) The main body of ovary is called **stroma**. The outer part of stroma is **cortex** and inner part is **medulla**. This is made up of blood vessels, lymphatics and nerve fibres.

II) Fallopian tubes:

- (1) Each fallopian tube extends from the **periphery of each ovary to the uterus**.
- (2) Each fallopian tube has **funnel shaped infundibulum**.
- (3) The edge of infundibulum has **finger like folds** called **fimbriae**.
- (4) Fimbriae collect ovum after ovulation.
- (5) Infundibulum leads to wide ampulla.
- (6) Isthmus is the last part which joins the uterus.
- (7) Fallopian tube is the site of fertilization. It conducts the ovum towards the uterus by peristalsis.
- (8) Fallopian tube is attached to body wall by **mesosalpinx** (fold of peritoneum).

III) Uterus:

- (1) Uterus is single and is also called **womb**. It is present **between urinary bladder and rectum**.
- (2) It is a large **pear shaped sac**. It is highly **muscular** and **vascular**.
- (3) It is connected to body wall by **mesometrium** (peritoneal fold).
- (4) The narrow part by which the uterus is connected to vagina is cervix.
- (5) The **cervical canal and vagina** together form **birth canal**.
- (6) The wall of the uterus is made up of outer perimetrium, middle myometrium and inner endometrium.
- (7) Endometrium undergoes cyclic changes called menstrual cycle.

IV) Vagina:

- (1) It is a large **fibro muscular tube** that extends from cervix to vaginal orifice.
- (2) It is lined by **non keratinized stratified squamous epithelium**. It is highly vascular.

V) Vulva :

- (1) The term vulva refers to the **external genitals** of the female.
- (2) The vestibule has two apertures the upper external urethral orifice of the urethra and the lower vaginal orifice of vagina.
- (3) Vaginal orifice is often **covered partially by a membrane** called **hymen**.
- (4) Clitoris is a sensitive, erectile structure, which lies at the upper junction of the two labia minora above the urethral opening.
- (5) Clitoris is **homologous to the penis of a male** as both are supported by corpora cavernosa.
- (6) **Mons pubis** is a cushion of fatty tissue covered by skin and pubic hair present above labia majora.

VI) Accessory reproductive glands of female:

1) Bartholin's glands:

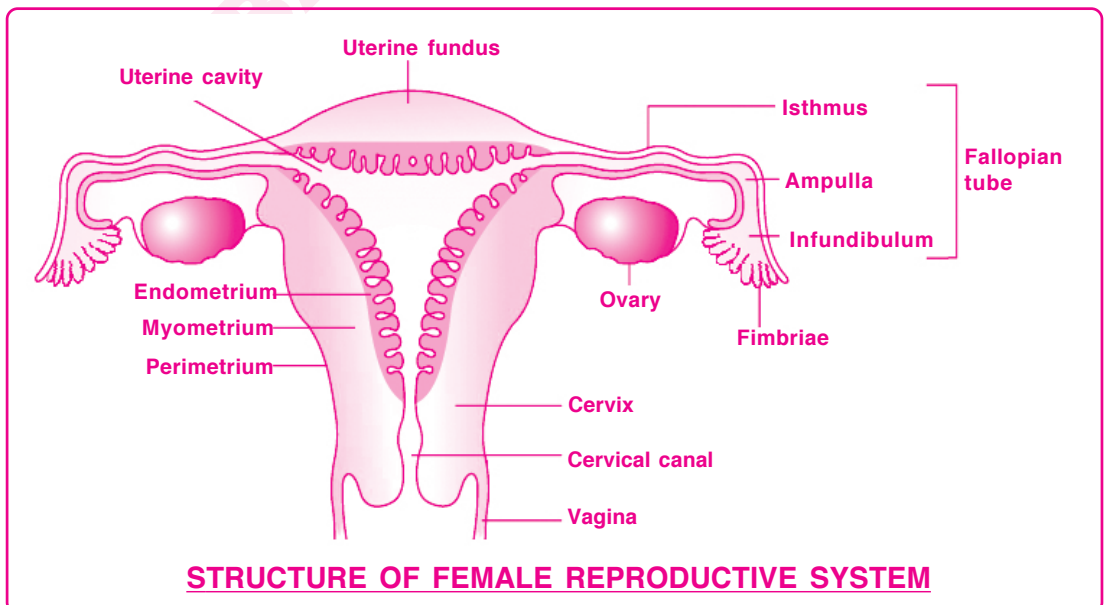
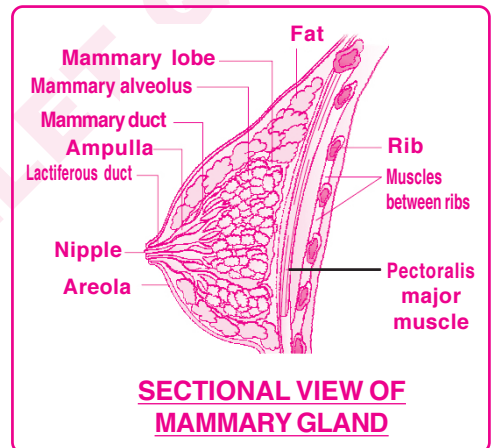
- (i) **Position:** The Bartholin's glands are two glands located slightly posterior and to the left and right of the opening of the vagina
- (ii) **Function:** They secrete mucus to lubricate the vagina and are homologous to the bulbourethral glands of the male reproductive system.

2) Skene's glands:

- (i) **Position:** The Skene's glands are located on the anterior wall of the vagina, around the lower end of the urethra.
- (ii) **Function:** They secrete a lubricating fluid when stimulated.

3) Mammary glands:

- (i) The mammary glands are paired structures (breasts) that contain glandular tissue and variable amount of fat.
- (ii) Mammary glands contain alveoli which secrete milk after the birth of child.
- (iii) The Alveoli open into mammary tubules. The tubules of each lobe join to form a mammary duct.
- (iv) Several mammary ducts join to form a wider mammary ampulla which is connected to lactiferous duct through which milk is sucked out by the baby.



21. Describe chromosomal theory of sex determination.

[TS 17, 17, 19,20]

A: Chromosomal theory of Sex determination:

In most of the animals, a pair of chromosomes are responsible for the determination of sex. These two chromosomes are called **sex chromosomes (or allosomes)**.

The two different chromosomes in the pair are X-chromosome & Y- chromosome

There are two types of sex chromosomal mechanism methods:

I) Male Heterogametic method

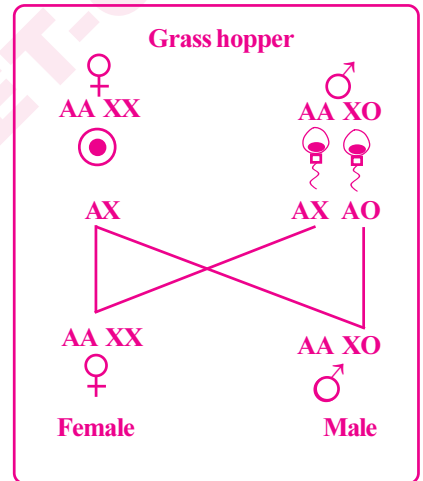
II) Female Heterogametic method

I) Male Heterogametic method: In this type, the female has two 'X' chromosomes and the male has only a single 'X' chromosome.

This is of two types: (1) XX-XO (2) XX-XY

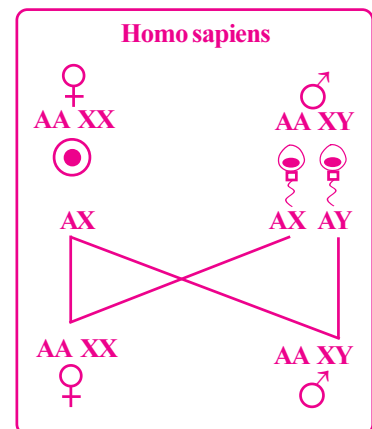
1) XX-XO type:

- (i) It is found in grass hoppers.
- (ii) Karyotype of female is AAXX and Karyotype of male is AAXO.
- (iii) Females have two X chromosomes and males have only one X chromosome.
- (iv) Unpaired X chromosome determines the sex of offspring.
- (v) The sperms are two types. 50% of sperms have AX complement and other 50% have only A complement.
- (vi) All the ova contains AX chromosomes.
- (vii) The sex of the offspring is decided by the sperm that fertilizes the ovum.
- (viii) If AX sperm is fertilised the child will be female
- (ix) If AO sperm is fertilised the child will be male.



2) XX-XY type:

- (i) It is found in human beings .
- (ii) Female is homogametic with Karyo type AAXX
Male is hetero gametic with Karyotype AAXY
- (iii) Females have 2 'X' chromosomes & Males have 1 'X' chromosome & 1 'Y' chromosome.
- (iv) 'Y' chromosome determines the sex of offspring.
- (v) 50% of sperms are AX and other 50% are AY.
- (vi) All the ova contains AX chromosomes.
- (vii) The sex of the offspring is determined by the sperm that fertilizes the ovum.
- (viii) If AX sperm is fertilized the child will be female (AAXX)
- (ix) If AY sperm is fertilized the child will be male (AAXY)



II) Female heterogametic Method: In this type, female produces two types of ova and male produces only one type of sperms.

This of two types. (1) ZO-ZZ type and(2) ZW-ZZ type.

1) ZO-ZZ type:

(i) It is found in Fumea (moths).

(ii) Karyo type of female is AAZO and

Karyo type of male is AAZZ

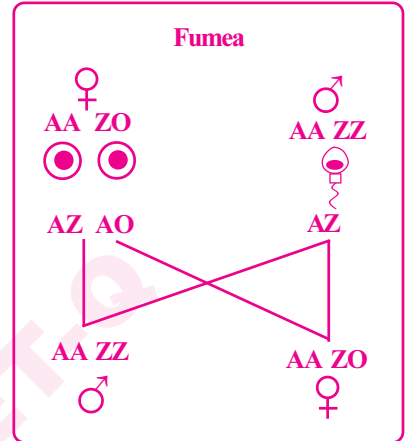
(iii) Female is heterogametic with one Z chromosomes and

Male is homogametic with two Z chromosomes.

(iv) The sex of the offspring is determined by the ovum that is fertilized.

(v) If AO ovum is fertilized, it will be female.

(vi) If AZ ovum is fertilized, it will be male.



2) ZW-ZZ type:

(i) It is found in birds.

(ii) Karyo type of female is AAZW and

Karyo type of male is AAZZ.

(iii) Female is heterogametic with Z and W chromosomes and

Male is homogametic with ZZ chromosomes.

(iv) The sex of the offspring is determined by the ovum that is fertilized.

(v) If AZ ovum is fertilised it will be male.

(vi) If AW ovum is fertilised it will be female.

