



MARCH-2023 (TS)

PREVIOUS PAPERS

IPE: MARCH-2023(TS)

Time : 3 Hours

SR.ZOOLOGY

Max.Marks : 60

SECTION-A**I. Answer ALL the following VSAQ:****10 × 2 = 20**

1. Give the dental formula of adult human beings.
2. Define Glomerular filtration.
3. Write the difference between actin and myosin.
4. Name the keystone bone of the cranium. Where is it located?
5. Write the names of any four mononuclear phagocytes.
6. What is erythropoietin? What is its function?
7. Define spermiogenesis and spermiation.
8. What is 'Amniocentesis'? Name any two disorders that can be detected by amniocentesis.
9. What is apiculture?
10. What does ADA stand for? Deficiency of ADA causes which disease?

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

11. What are the functions of liver?
12. How is respiratory movements regulated in man?
13. Draw a labelled diagram of the T.S of the spinal cord of man.
14. Write a note on Addison's disease and Cushing's syndrome.
15. Describe erythroblastosis foetalis.
16. What is meant by genetic drift? Explain genetic drift citing the example of Founder Effect.
17. Write a short note on the theory of mutations.
18. Discuss in brief about 'Avian Flu'.

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

19. Describe chromosomal theory of sex determination.
20. Describe female reproductive system of a woman with the help of a labelled diagram.
21. Write notes on the working of the heart of man.

IPE TS MARCH-2023 **SOLUTIONS**

SECTION-A

1. Give the dental formula of adult human beings.

[TS 23][TS MAY-19]

A: 1) The **dental formula** of adult human beings is $\frac{2123}{2123}$

2) This formula denotes the arrangement of teeth in each half of both the jaws.

3) They are: Incisors(I)= $\frac{2}{2}$; Canines (C)= $\frac{1}{1}$; Premolars (PM)= $\frac{2}{2}$; Molars (M)= $\frac{3}{3}$

2. Define Glomerular filtration.

[TS 17,22,23] [AP 17]

A: 1) Glomerular filtration: The first step in the formation of urine is the 'filtration' of blood from glomerulus into the lumen of Bowman's capsule.

2) This non-energy consuming process is called glomerular filtration.

3. Write the difference between actin and myosin.

[AP 15,19,22][TS 23]

A:

Actin	Myosin
1) Actin is a thin contractile protein	1) Myosin is thick contractile protein
2) Actin is present in light band called isotropic band .	2) Myosin is present in dark bands called anisotropic band .
3) Actin filaments are connected to Z line	3) Myosin filaments are connected to M line.

4. Name the keystone bone of the cranium. Where is it located?

[TS 18, 19,23]

A: 1) Sphenoid bone is the keystone bone present in the base of cranium.

2) It articulates with most of cranial bones.

5. Write the names of any four mononuclear phagocytes.

[TS 23]

A: Mono nuclear phagocytes:

1) Histiocytes of connective tissue

2) Kupffer cells of liver

3) Microglia in the brain

4) Osteoclasts of bone.

5) Synovial cells of synovial fluid.

6. What is erythropoetin? What is its function?**[TS 23] [AP 19]**

- A:** 1) **Erythropoetin** is a hormone produced by **Juxta glomerular cells** of kidney.
- 2) It stimulates production of RBC by regulating the proliferation and differentiation of erythroid progenitor cells in bone marrow.
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7. Define spermiogenesis and spermiation.**[TS 18,23]**

- A:** 1) **Spermiogenesis** is the process in which **spermatids transform into spermatozoa**.
- 2) **Spermiation** is the process in which spermatozoa (sperm heads) are released from seminiferous tubules.
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8. What is 'amniocentesis'? Name any two disorders that can be detected by amniocentesis.**[TS 18, 19,20,23][AP 16,17,18,19,20]**

- A:** 1) **Amniocentesis** is a diagnostic procedure to **detect genetic defects in the unborn baby**.
- 2) The disorders that can be detected are
- (i)Down syndrome (ii)Edward's syndrome and (iii)Turner's syndrome.
- 3) In this procedure, Amniotic fluid is drawn and foetal cells are tested.
- 4) But, it is misused and has become a practice to know the sex of the child.
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9. What is apiculture?**[TS 15,17,18,23][AP 17,20]**

- A:** 1) Apiculture is Bee keeping.
- 2) It is the maintenance of bee-hives for the production of honey and wax.
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10. What does ADA stand for? Deficiency of ADA causes which disease? [TS 23]

- A:** 1) ADA stands for Adenosine Deaminase.
- This enzyme is very important for immunity system to function.
- 2) ADA deficiency causes **Severe Combined Immuno Deficiency(SCID)**.

SECTION-B

11. What are the functions of liver?

[TS 15, 19,20,23]

A: Important Functions of liver: Secretion, Synthesis, Storage, Detoxification, T-Regulation.

- 1) Liver secretes **Bile juice**. (It helps in the emulsification and digestion of fats).
- 2) Liver helps in the synthesis of **Carbohydrates**.
- 3) Liver helps in the synthesis of **Lipids** (cholesterol, triglycerides).
- 4) Liver helps in the synthesis of **Plasma proteins**
(like albumin, globulin and blood clotting factors).
- 5) Liver stores **excess Glucose**, some vitamins & minerals.
- 6) Liver detoxifies '**Toxic substances**' that enter the gut along with food.
- 7) Liver removes unwanted substances and microbes through Kupffer cells present in sinusoids.
- 8) Liver acts as a '**Thermo regulatory organ**' (keeps the same temperature in the body).
- 9) Liver performs **Deamination** and **formation of urea** via ornithine cycle.
- 10) Liver acts as a **Haemopoietic organ** (produces RBC) in foetus.
- 11) Liver acts as **Erythroclastic organ** (destructs aged RBC) in adults.

12. How is respiratory movements regulated in man? [AP MAR-18] [TS MAR-23]

A: Regulation of respiratory movements:

Except the forced inhalation and forced exhalation, the respiratory movements are involuntary.

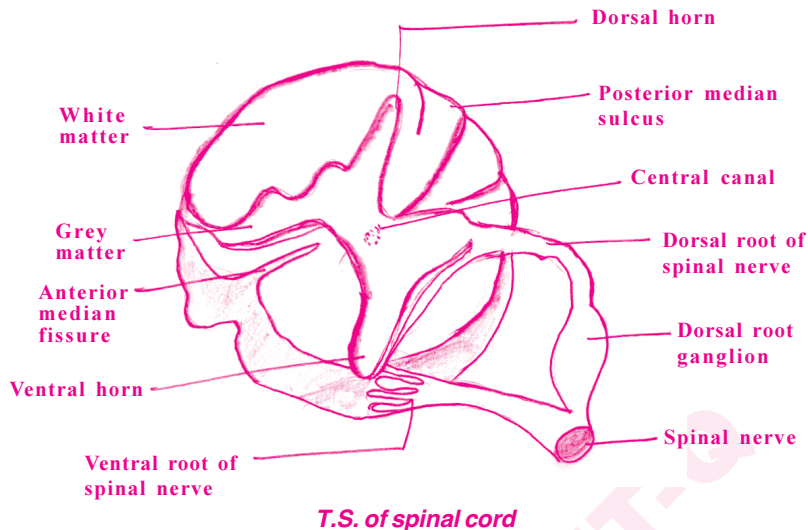
The regulation of respiration is under the control of the following:

- 1) Respiratory rhythm centre of medulla oblongata of the brain (RRC).
- 2) Pneumotaxic centre of pons of cerebellum (brain stem)
- 3) Chemosensitive area close to respiratory rhythm centre.
- 4) Receptors present inside of aortic arch and carotid arteries. They send signals to RRC when CO_2 and H^+ concentration increases in blood.
- 5) Respiratory rhythm centre is mainly responsible for respiratory movements.
- 6) Pneumotaxic centre send signals to RRC to alter the respiratory rate when necessary.
- 7) Chemosensitive area is sensitive to CO_2 and H^+ ions. It sends signals to RRC when CO_2 and H^+ ions are more in blood. Then RRC increases respiratory rate to remove the CO_2 and H^+ so that necessary action is taken.

13. Draw a labelled diagram of the T.S of the spinal cord of man.

[TS 23]

A:



14. Write a note on Addison's disease and Cushing's syndrome. [TS 17,18,19,19,22,23]

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. Describe erythroblastosis foetalis.**[TS 17,23][AP 16,17,19,22]**

- A:** 1) **Erythroblastosis foetalis** (Haemolytic disease) is an alloimmune condition that develops in an Rh positive foetus, whose father is Rh positive and mother is Rh negative.
- 2) The genetic consequence in this marriage is the Rh incompatibility between the mother (Rh^-) and the growing foetus (Rh^+)
 - 3) At the time of delivery, the Rh^+ blood cells may enter the mother's blood through ruptured placenta.
 - 4) Mother's immunity system is sensitized and Anti Rh antibodies are produced.
 - 5) The first child is safe because delivery is over and antibody formation in mother takes time.
 - 6) During the second pregnancy, if the second child is Rh positive, these antibodies cross the placental border and enter the foetal blood circulation. The blood cells of the Rh positive foetus are destroyed causing HDN (Haemolytic Disease of New born)
 - 7) To compensate loss of cells, foetal hemopoietic system releases erythroblasts (early stage of RBC) into circulation. That is why this disease is called erythroblastosis foetalis.
 - 8) Now a days the mother is given anti D (anti Rh anti bodies), when she is pregnant which prevent the formation of antibodies during pregnancy i.e., to prevent sensitization of mother's immunity system.

16. What is meant by genetic drift? Explain genetic drift citing the example of Founder Effect.**[TS 18,23][AP 19,16]**

- A:** 1) **Genetic Drift:** The change in the frequency of a gene that occurs merely by chance and not by selection in small populations, is called genetic drift.
- 2) A gene is with two alleles. If the frequency of a particular gene is 1%, the probability of losing that allele by chance from the small population is more. The end result is either fixation or loss of that allele. The probability of reaching the end point depends on the size of population.
 - 3) Genetic drift tends to reduce the amount of genetic variation within the population, mainly by removing the alleles with low frequencies. Genetic drift can be exemplified by the founder effect.
 - 4) **Founder effect:** If a small group of individuals from a population start a new colony in an isolated region, those individuals are called the founders of the new population. The allelic frequency of their descendants are similar to those of the founders rather than to either ancestral parent population.

Ex: Presence of O^{+ve} blood group is nearly 100% in Red Indians.

17. Write a short note on the theory of mutations.**[TS 19,23][AP 15]**

A: 1) Mutations: These are sudden, random inheritable changes that occur in organisms.

- 2) Mutation theory was proposed by Hugo de Vries.
- 3) He worked on *Oenothera lamarckiana*, commonly called evening primrose.
- 4) He found four different forms of *Oenothera lamarckiana* (evening primrose)
 - (i) Small style form - *O. brevistylis*.
 - (ii) Smooth leaves form - *O. levifolia*
 - (iii) Giant form - *O. gigas*
 - (iv) Dwarf form - *O. nanella*
- 5) All the four forms are mutant forms.
- 6) Darwin called mutations as sports of nature.
- 7) Bateson called them as discontinuous variations.

Salient features of Mutation theory:

- 1) Mutations occur from time to time in a naturally breeding population.
- 2) They are discontinuous and not accumulated over generation.
- 3) They are full-fledged and there are no intermediate forms.
4. They are subjected to natural selection.

18. Discuss in brief about 'Avian Flu'.**[AP MAR-20][TS 22,23]**

A: 1) Avian Flu: It is an important and dangerous viral disease affecting poultry birds and also man.

2) Causative Organism: Bird flu is caused by avian flu virus H5N1. It can start a world wide epidemic (pandemic disease).

3) Mode of Infection: Simply by touching contaminated surfaces. Infected birds release the virus through saliva and faeces for about 10 days.

4) Symptoms: Humans infected by H5N1 show typical flu like symptoms, dry cough with phlegm diarrhoea, breathing difficulty, fever, headache sore throat and body pains.

5) Prevention:

- (i) Consumption of undercooked chicken to be avoided.
- (ii) Poultry people use protective clothes and wear masks.
- (iii) Complete culling (elimination) of infected birds either by burning or burying.

SECTION-C

19. Describe chromosomal theory of sex determination.

[TS 17, 17, 19,20,23]

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

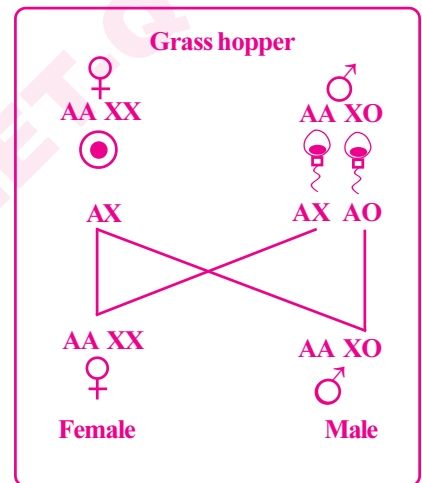
II) Female Heterogametic method

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

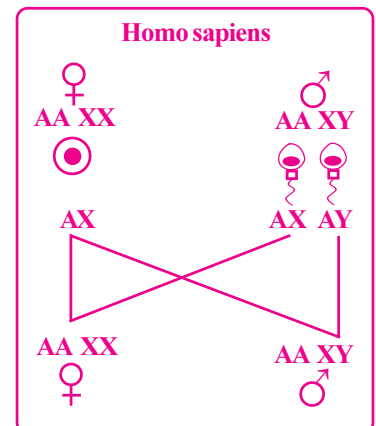
1) XX-XO type:

- (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)

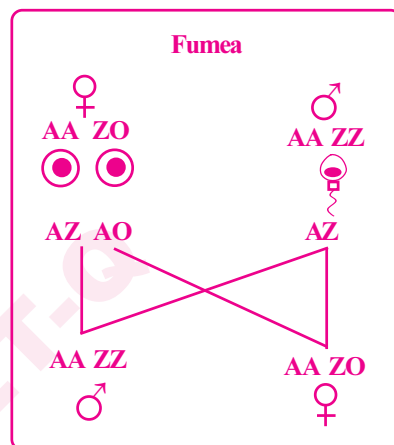


II) Female heterogametic Method: In this type, female produces two types of ova and male produces only one type of sperms.

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

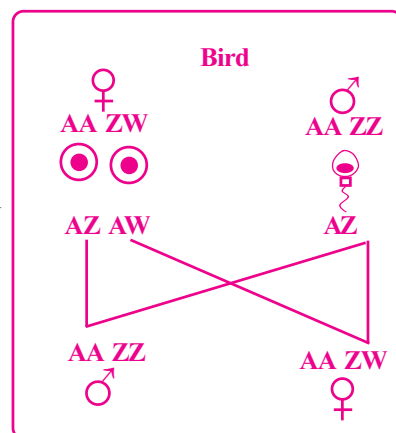
1) ZO-ZZ type:

- (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.



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, 17,19,20,23]

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:

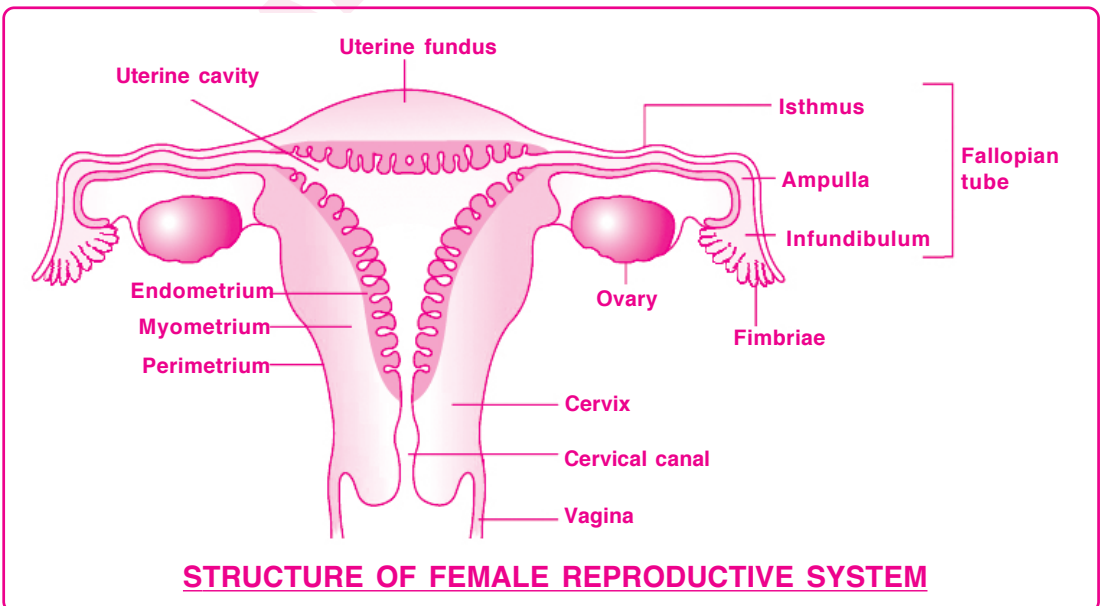
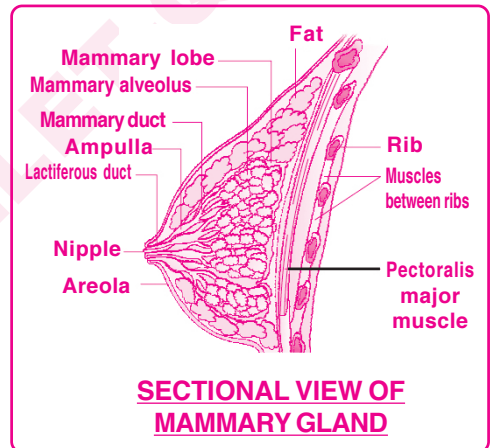
- Position:** The Bartholin's glands are two glands located **slightly posterior and to the left and right** of the opening of the **vagina**
- Function:** They secrete **mucus to lubricate the vagina** and are homologous to the bulbourethral glands of the male reproductive system.

2) Skene's glands:

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

3) Mammary glands:

- The mammary glands are paired structures (breasts) that contain glandular tissue and variable amount of fat.
- Mammary glands contain alveoli which secrete milk after the birth of child.
- The Alveoli open into mammary tubules. The tubules of each lobe join to form a mammary duct.
- 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. Write notes on the working of the heart of man.

[TS 16,23][AP 15,16,17,18,19]

A: Working of heart: It involves 4 phases.

- I) Generation & conduction of action potentials. II) Cardiac cycle
III) Cardiac Output IV) Double circulation.

I) Generation & conduction of action potentials: The contractions of heart chambers are due to the **action potential** generated by **nodal tissue SAN**. They cause the contraction of atria.

II) Cardiac cycle: The cardiac events that occur from the beginning of one heart beat to the beginning of the next beat is called cardiac cycle. It lasts for about **0.8 seconds**

Cardiac cycle consists of 3 phases (1) atrial systole (2) ventricular systole (3) cardiac diastole

(1) Atrial systole: The SAN generates an action potential which stimulates both the atria and to contract simultaneously causing the 'atrial systole'.

- (i) It lasts for about **0.1 s**.
- (ii) This **increases the flow of blood** into the ventricles by about 30%.
- (iii) The remaining blood flows into the ventricles before the atrial systole.

(2) Ventricular systole: The action potential reaches AVN. It is a **relay centre**. The electrical impulses pass through bundle of His and purkinjefibres. This causes ventricular systole.

- (i) It lasts for about **0.3 s**.
- (ii) The atria undergo relaxation along with the ventricular systole.
- (iii) It increases the pressure causing the closure of the AV valves.
- (iv) This **prevents the 'backflow'** of blood.
- (v) It results in the production of the **first heart sound** known as '**Lub**'.
- (vi) As the ventricular pressure increases further, the semilunar valves are open. This allows the blood to flow into the aortic arches.

(3) Cardiac diastole: The ventricles now relax and the ventricular pressure falls.

This causes the closure of the semilunar valves which prevents the back flow of blood.

- (i) It lasts for about **0.4 s**.
- (ii) This results in the production of the **second heart sound** known as '**Dup**'.
- (iii) All the heart chambers are now again in a relaxed state (joint diastolic phase). Soon another cardiac cycle begins.

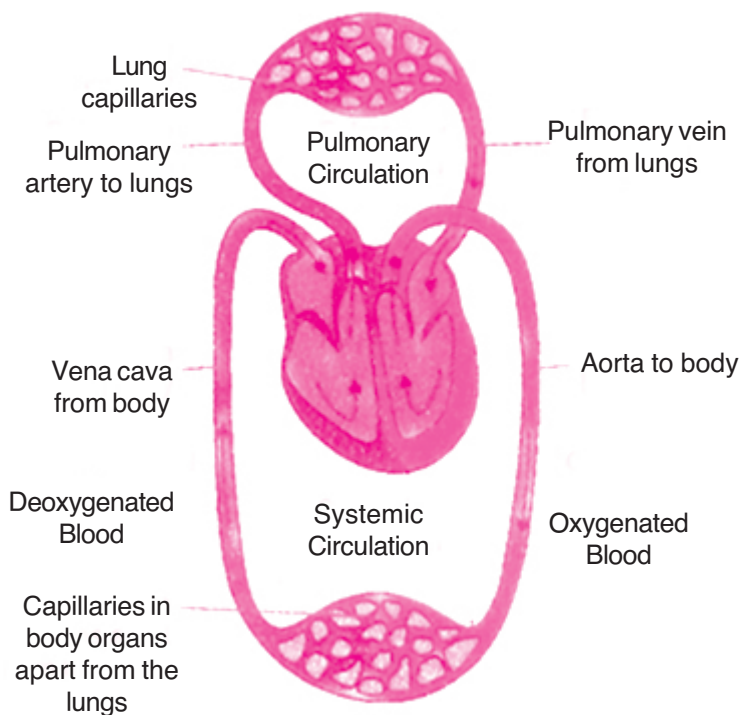
III) Cardiac Output: The volume of blood pumped out by each ventricle for each heart beat is known as stroke volume. The volume of blood pumped out by the heart from each ventricle per minute is called cardiac output.

Cardiac output = stroke volume(70ml) × No.of beats per minute(72 beats) = 5040 ml/min or approximately 5 liters.

IV) Double Circulation: There are 2 independent circulations.

(1) Pulmonary circulation: Blood from the right ventricle flows through pulmonary arteries to lungs. The blood is aerated and goes back to left atrium through pulmonary veins.

(2) Systemic Circulation: The left ventricle pumps the blood through systemic arch to various parts of the body through arteries. Blood collected from various parts of the body by veins is brought back to the right atrium through venaecavae.



DOUBLE CIRCULATION

🔑 Not compulsory to draw this in the Public Exam.