



MARCH-2023 (AP)

PREVIOUS PAPERS

IPE: MARCH-2023(AP)

Time : 3 Hours

SR.ZOOLOGY

Max.Marks : 60

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

1. Write the names of any four mononuclear phagocytes.
2. What is chyme?
3. Name the cranial meninges covering the brain of man.
4. Mention any four fish by-products.
5. What are the measures one has to take to prevent contracting STDs?
6. What do you know about arbor vitae?
7. Name the yellow mass of cells accumulated in the empty follicle after ovulation. Name the hormone secreted by it and what is its function?
8. MRI scan is harmless-justify.
9. What are renal pyramids and renal papillae?
10. "Colostrum is very much essential for the new born infants". Justify.

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

11. Describe the structure of synovial joint with the help of a neat labelled diagram.
12. Draw a neat labelled diagram of L.S. of a tooth.
13. How is sex determined in human beings?
14. Distinguish between homologous and analogous organs.
15. What are the major transport mechanisms for CO₂? Explain.
16. Explain in brief structure of Insulin.
17. Compare a 'pituitary dwarf' and a 'thyroid dwarf' in respect of similarities and dissimilarities they possess.
18. Explain Darwin's theory of Natural Selection with industrial melanism as an experimental proof.

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

19. Describe male reproductive system of a man. Draw a labelled diagram of it.
20. Describe the structure of the heart of man with the help of neat labelled diagram.
21. What is crisscross inheritance? Explain the inheritance of one sex linked recessive character in human beings.

IPÉ AP MARCH-2023

SOLUTIONS

SECTION-A

1. Write the names of any four mononuclear phagocytes.

[AP 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.

2. What is chyme?

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

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.

3. Name the cranial meninges covering the brain of man.

[AP,TS 22]

A: The brain of man is covered & protected by three cranial meninges. They are
1) **Duramater**: It is an outer thick double layered membrane.
2) **Arachnoid membrane**: It is a thin net like membrane.
3) **Piamater**: It is a inner thin membrane closely attached to brain.

4. Mention any four fish by-products

[TS 19][AP 19,23]

A: Fish by-products:

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

5. What are the measures one has to take to prevent contracting STDs?

A: Measures to prevent STDs:

[AP 17,18,23][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.

6. What do you know about arbor vitae?

[AP 23] [AP,TS MAR-20]

A: **Arbor vitae:** Arbor vitae is characteristic arrangement of white matter in the form of a tree in cerebellum of human brain. It is surrounded by grey matter (cerebellar cortex)

7. Name the yellow mass of cells accumulated in the empty follicle after ovulation. Name the hormone secreted by it and what is its function? [AP MAR-16,20,23]

A: 1) After ovulation, the empty follicle is filled with yellow mass of glandular cells called **corpus luteum**.
2) It secretes **progesterone** which maintains pregnancy.

8. MRI scan is harmless-justify.

[AP 18,23] [TS 18]

A: 1) **MRI Scan:** MRI means Magnetic Resonance Imaging.

It uses magnetism, radio waves and computer to produce body images.

2) MRI does not use ionising radiation as used in X-rays.

So MRI scanning is a very **safe procedure**.

9. What are renal pyramids and renal papillae?

[AP MAR-23]

A: 1) The medulla of kidney is projected into cone shaped masses called renal pyramids.
2) They contain Henle's loops of Juxta medullary nephrons and straight collecting ducts.
3) Renal papilla is the tip of the renal pyramid opens into the pelvis.

10. "Colostrum is very much essential for the new born infants". Justify. [AP 23]

A: 1) **Colostrum:** Colostrum is the first milk produced by the mother after delivery (child birth).

It has plenty of **IgA antibodies** to protect the infant from infections.

2) These antibodies are transferred from mother to the infant. It is called natural passive immunity.

SECTION-B

11. Describe the structure of synovial joint with the help of a neat labelled diagram.

[AP 17, 19, 19,23][TS 17]

A: 1) **Synovial Joint** is a 'freely moving joint'

between two bones.

2) Structural parts of Synovial Joint:

i) Articular Capsule

ii) Articular Cartilage (Hyaline)

iii) Synovial Cavity

3) Articular Capsule consists of two layers.

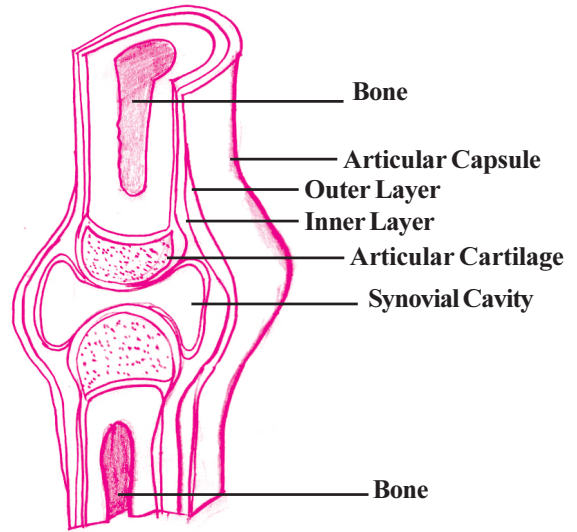
Outer fibrous layer keeps the bones together without dislocating.

Inner layer seals the synovial fluid.

4) The ends of joint bones are formed with

smooth Articular Cartilage which minimises friction between bones.

5) Synovial cavity is filled with 'Synovial fluid' which acts as Lubricator and Shock Absorber.

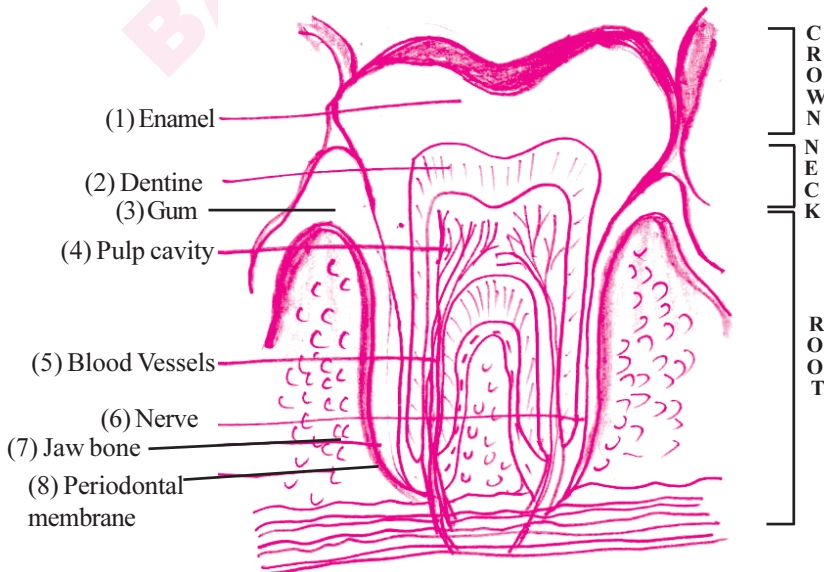


Structure of Synovial Joint

12. Draw a neat labelled diagram of L.S. of a tooth.

[AP 23]

A:



L.S.of tooth

13. How is sex determined in human beings?**[AP 18,23][TS 15,22]****A: Sex determination in human beings:**

- 1) The sex determining mechanism in case of humans is XX-XY type.
- 2) Out of 23 pairs of chromosomes present, 22 pairs are exactly same in both males and females.
- 3) The female's Karyotype is 44XX; The male's Karyotype is 44XY
- 4) Female produces same type of gametes. Male produces two types of gametes.
- 5) Gametes produced by female are 22X and Gametes produced by male are 22X and 22Y
- 6) When 22X sperm fertilizes 22X ovum, the result is a female child 44XX.

When 22Y sperm fertilizes 22X ovum, the result is a male child 44XY.

- 7) So, it is clear that, it is the genetic makeup of the sperm that determines the sex of the child.
- 8) It is also clear that in each pregnancy there is always 50 percent probability for either a male or a female child.

14. Distinguish between homologous and analogous organs.**[TS 15,17,18,19][AP 15,17,18,19,23]**

A: Homologous and Analogous organs are evidences of evolution from comparative anatomy.

Homologous organs	Analogous organs
<ol style="list-style-type: none">1) The organs which have similar structure and origin but not necessarily the same function are called homologous organs.2) They suggest divergent evolution.3) Ex: The forelimbs of vertebrates, Flipper of Whale, wings of birds, hand of man and wings of bat4) All these organs have same arrangement of bones but their functions vary to suit their mode of life.	<ol style="list-style-type: none">1) The organs which have different origin but have same function are analogous organs.2) They suggest convergent evolution.3) Ex: Wings of butterfly and wings of birds.4) When the animals live in same habitat and lead a similar mode of life they tend to have same body form.

15. What are the major transport mechanisms for CO_2 ? Explain.

[TS 17,19] [AP 19,19,23]

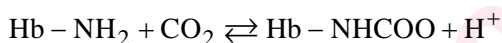
A: Transport Mechanism of CO_2 :

CO_2 is transported to lungs in three different ways.

(1) 7% as carbonic acid (2) About 20-25% as carbamino compound (3) About 70% as bicarbonates.

1) As carbonic acid: 7% of CO_2 combines with H_2O to form carbonic acid. It is transported to lungs where it is dissociated into water and CO_2 .

2) As carbamino compound: About 20-25% of CO_2 combines with free amino group of haemoglobin and forms carbamino haemoglobin. It is a reversible reaction.



3) As bicarbonates: About 70% of CO_2 combines with water to form H_2CO_3 in the presence of carbonic anhydrase. In RBC, the carbonic acid dissociates into $\text{HCO}_3^- + \text{H}^+$.

4) At the alveolar site where pCO_2 is low, the reaction proceeds in the opposite direction, leading to the formation of CO_2 and H_2O .

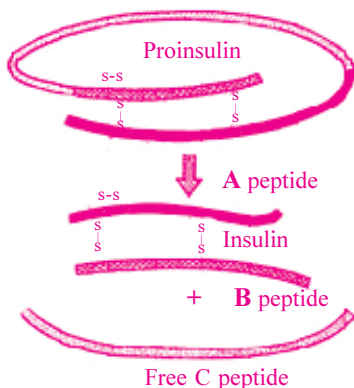
5) Thus CO_2 is mostly trapped as bicarbonate at the tissues and transported to the alveoli, where it is released out as CO_2 .

16. Explain in brief structure of Insulin.

[AP MAR-15,23]

A: Structure of Insulin:

- 1) Insulin is a protein hormone secreted by β cells of pancreas.
- 2) Human insulin is made up of 51 amino acids in two polypeptide chains.
- 3) 'A' chain consists 21 amino acids and 'B' chain consists of 30 amino acids.
- 4) The two chains are held together by disulphide linkages.
- 5) Insulin is primarily synthesized as a prohormone which contains an extra stretch called 'C peptide'.



17. Compare a 'pituitary dwarf' and a 'thyroid dwarf' in respect of similarities and dissimilarities they possess.

[AP MAR-23]

A: Dissimilarities:

A) Pituitary dwarf:

- (i) Due to hyposecretion of growth hormone during childhood growth is retarded. The result is a dwarf person or midget.
- (ii) The pituitary dwarf is sexually and intellectually a normal individual.

B) Thyroid dwarf:

- (i) Hypothyroidism during pregnancy causes defective development of growing baby. This disorder is called cretinism.

The characteristics of cretinism are as follows:

- (i) Stunted growth
- (ii) Mental retardation
- (iii) Low intelligence quotient
- (iv) deafness
- (v) mutism

Similarities:

Both types can be corrected if the hormones are administrated in the early stages.

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

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

- 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.

SECTION-C

19. Describe male reproductive system of a man. Draw a labelled diagram of it.

A: MALE REPRODUCTIVE SYSTEM [AP 16,17,18,20,23][TS 16,17,18,19,22]

Male Reproductive system consists of 6 parts:

I) Testes II) Epididymis III) Vasa deferentia IV) Urethra V) Penis VI) Accessory glands

I) Testes:

- (1) Testes or testicles are a pair of oval pinkish **male primary sex organs**.
- (2) They are suspended outside the abdominal cavity within a **pouch** called **scrotum**.
- (3) Sperms do not develop at body (abdominal) temperature. So they go into scrotum.
- (4) The scrotum is connected to abdominal cavity through inguinal canal.
- (5) Inside the scrotum, testis is held by gubernaculum.
- (6) Spermatic cord is formed by the blood vessels, nerve and vas deferens. This cord runs from abdomen to each testis through inguinal canal.
- (7) Tunica albuginea project inside the testis as septa. There are about 250 testicular lobules in each testis. Each lobule contains 2 or 3 highly coiled seminiferous tubules.
- (8) Each seminiferous tubules consists of germinal epithelium and sertoli cells.
- (9) Germinal epithelium produces sperms.
- (10) Sertoli cells nourish the sperms.
- (11) The regions outside the seminiferous tubules called interstitial spaces contain Leydig cells.
- (12) They produce male hormone testosterone called androgens.
- (13) Testosterone controls the development of secondary sexual characters and spermatogenesis.
- (14) Seminiferous tubules open in rete testis. Rete testis opens into vasa efferentia. Vasa efferentia open into a highly coiled epididymis.

II) Epididymis :

- (1) It is a **narrow tightly coiled tube** located along **posterior** surface of each testis.
- (2) Vasa deferentia leave the testis and open into epididymis .
- (3) **Epididymis** provides space for **maturation** and **storage of sperms**.
- (4) Epididymis is divided into 3 regions
 - (i) caput epididymis (ii) corpus epididymis and (iii) cauda epididymis.
- (5) Caput epididymis receives the sperms from the testis through vasa efferentia.

III) Vasa deferentia:

- (1) The Vasa deferentia is a long, narrow, muscular tube.
- (2) It starts from the tail of the epididymis, passes through the inguinal canal into the abdomen and loops over the urinary bladder.
- (3) The two ducts open into urethra at the centre of the prostate gland.

IV) Urethra:

- (1) The **urethra originates from the urinary bladder** and extends through the penis to its external opening called urethral meatus.
- (2) The **urethra** provides an **exit for urine** as well as for semen during ejaculation.
- (3) Urethra is shared terminal duct of the reproductive and urinary systems.
- (4) Urethra is the urinogenital duct of man passes through penis to open outside.

V) Penis:

- (1) The penis serves as a **urinal duct**.
- (2) It is the **intromittent organ** that transfers spermatozoa to the vagina of a female.
- (3) It has **3 columns of tissue**. Two upper **corpora cavernosa** and **one ventral corpus spongiosum**.
- (4) The terminal enlarge part is glans penis covered by loose skin (fore skin) called **prepuce**.
- (5) Skin and a subcutaneous layer enclose all three columns, which consist of special tissue that helps in erection of the penis to facilitate insemination.

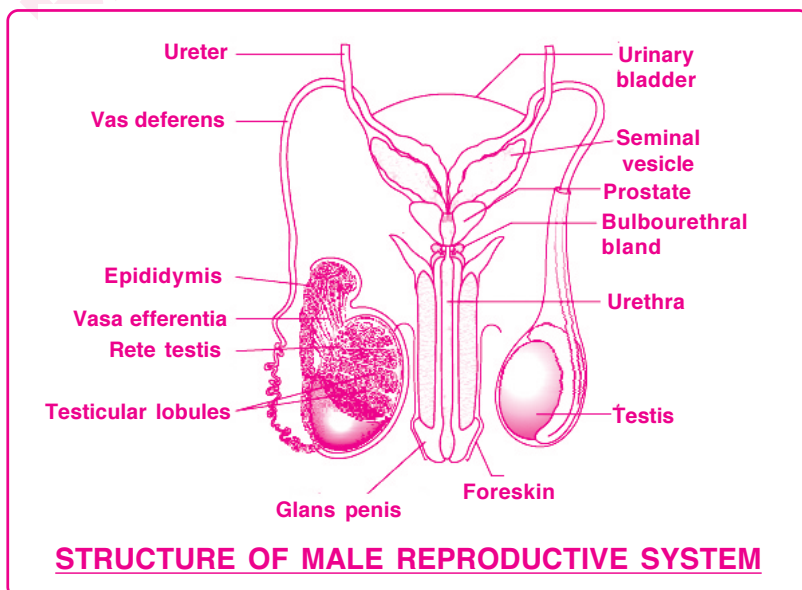
VI) Male accessory genital glands:**(1) Seminal vesicles:**

- (i) A pair of simple tubular glands is present below the urinary bladder. Each seminal vesicle opens into the corresponding vas deference.
- (ii) Its secretion constitutes 60% of total seminal fluid. It is alkaline and viscous fluid.
- (iii) **Fructose acts as the main energy source of the sperm.**

(2) Prostate gland: (i) It is present below the urinary bladder. Its contribution to seminal fluid is 15-30%. (ii) Its secretion is **slightly acid**. It **activates the sperms** and provides nutrition.

(3) Bulbourethral glands:

- (i) These are present below the prostate gland. They add an alkaline fluid to semen during the process of ejaculation.
- (ii) The fluid secreted by these glands **lubricates the urethra**.



20. Describe the structure of the heart of man with the help of neat labelled diagram.

[AP 18,22,23][TS 17,16,19,20,22]

A: Structure of the Human heart: Human heart is a **hollow muscular**, cone shaped and pulsating organ situated between lungs. Its size is about a clenched fist.

Human heart consists of 4 parts:

I) Pericardium II) Heart wall III) External Structure IV) Internal Structure

I) Pericardium: Heart is covered by **double walled pericardium**. The outer layer is fibrous pericardium and inner layer is serous pericardium. In between these two layers, there is **pericardial fluid** which reduces friction and allows free movement of the heart.

II) Heart wall: It consists of 3 layers.

(1) Outer epicardium (2) Middle myocardium (3) Inner endocardium.

III) External Structure : Human heart has four chambers.

(1) Two small upper chambers are called **atria** (L.A & R.A)

(2) Two large lower chambers are called **ventricles** (L.V & R.V)

(3) Atria and ventricles are separated by a deep transverse groove called **coronary sulcus**.

(4) Each atrium has small ear lobe like projection called auricular appendix.

(5) The ventricles are separated by two inter ventricular grooves, in which the coronary arteries and their branches are located.

IV) Internal structure: It consists of 4 parts.

(1) Atria (2) Ventricles (3) Nodal tissue (4) Aortic arches.

(1) Atria:

(i) Atria are thin walled **blood receiving chambers**. The right one is larger than the left.

(ii) The two atria are separated by thin **inter-atrial septum**.

(iii) Atria and ventricles are separated by a membrane called atrio-ventricular septum.

(iv) In the foetal heart, the atrial septum has a small pore called **foramen ovale**.

(v) In adults, **fossa ovalis** is present in the inter atrial septum

(vi) Bicuspid valve is in between L.A & L.V.

(vii) Tricuspid valve is in between R.A & R.V.

(2) Ventricles :

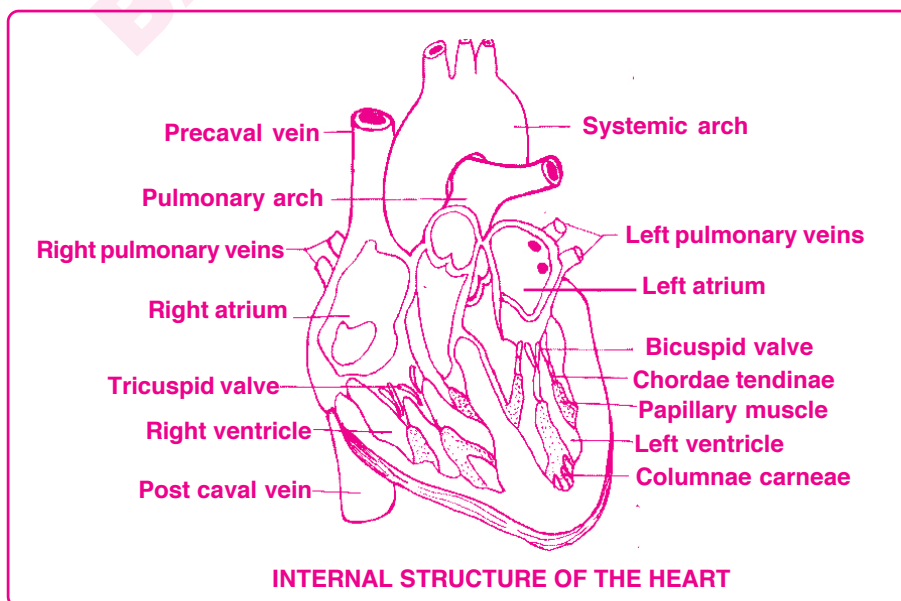
- (i) These are thick walled blood 'pumping chambers' (lower chambers)
- (ii) The two ventricles are separated by an **interventricular septum**.
- (iii) The wall of the left ventricle is thicker than the right ventricle
- (iv) The inner surface of the ventricles is raised into muscular ridges called **columnae carnaeae**.
- (v) Some of these ridges are large and conical, and are called **papillary muscles**.
- (vi) **Chordae tendineae** are collagenous cords that connect papillary muscles to the tricuspid valve and the bicuspid valve in the heart .

(3) Nodal tissue :

- (i) It is a **modified heart muscle**. It consists of **two nodes** and **fibres**.
- (ii) A patch of this tissue is present in **SAN**(sinoatrial node). It is located in the right upper corner of right atrium, close to the opening of superior venacava.
- (iii) Another mass of this tissue called **AVN** (atrioventricular node) is seen in the lower left corner of the right atrium, close to the opening of coronary sinus.
- (iv) AVN forms AV bundle or "His" bundle. It is divided into right and left bundle branches.

(4) Aortic arches: There are two aortic arches in man.

- (i) Pulmonary Arch:** It arises from the left anterior angle of the right ventricle. Its opening is guarded by the pulmonary valve and it carries deoxygenated blood to the lungs.
- (ii) Systemic Arch:** It arises from the left ventricle. Its opening is guarded by the aortic valve. It transports oxygenated blood to different parts of the body through its branches.



21. What is crisscross inheritance? Explain the inheritance of one sex linked recessive character in human beings. [AP 15,17,19,23][TS 15,16,19]

A: I) Criss Cross inheritance: T.H.Morgan observed sex linked inheritance in *Drosophila melanogaster*.

The X-linked recessive character present in a man is inherited to his grandson through his daughter. This type of inheritance is called criss-cross inheritance.

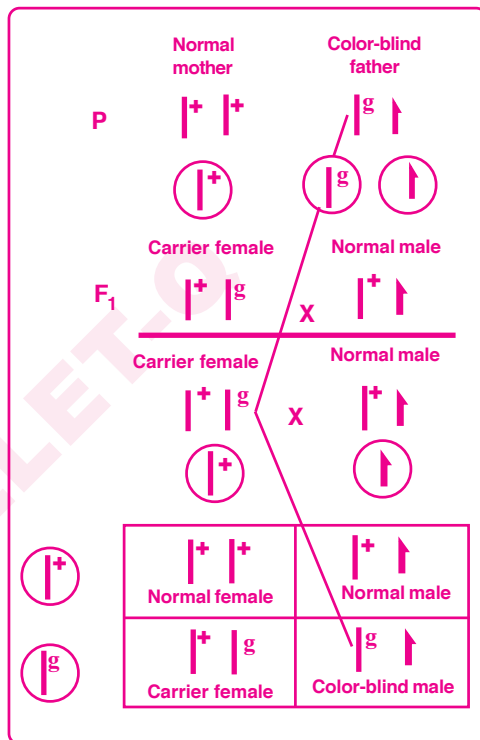
Two best examples of criss-cross inheritance are Colour blindness and Haemophilia.

II) Explanation:

- (1) Every gene whether dominant or recessive is expressed phenotypically.
- (2) Males have only one X chromosome.
- (3) Males are more prone to X-linked recessive gene expression.
- (4) Females have two X chromosome. There are more than 50% of chances of having a dominant gene. So females are less prone to X-linked recessive gene expression.

III) Colour Blindness:

- (1) The retina of eye is made up of rods and cone cells.
- (2) The cone cells are responsible for colour vision.
- (3) A recessive gene present on X chromosome causes colour blindness (Red-green).
- (4) The dominant gene influences normal colour vision.



- (5) When a woman ($AAX^{C}X^{C}$) with normal vision marries a 'colour- blind' man ($AAX^{cb}Y$), all the daughter will be the carriers. Their Karyotype is ($AAX^{C}X^{cb}$) with normal vision. Hence all the sons have normal vision. Their Karyotype is ($AAX^{C}Y$).

- (6) When the carrier daughter marries a man with normal colour vision, 50% of sons gets colour blindness. All others will have normal vision, of which 50% of daughters are carriers. Here the colour blind character of the parent is inherited by grandson through the carrier daughter.

IV) Other possible inheritances:

- 1) When both parents are colour blind all their children will be colour blind.
- 2) When mother is colour blind and father has normal vision, all their sons inherit colour blindness from mother. All the daughter will be carriers because they get a dominant gene from father and recessive gene from mother.
- 3) When mother is a carrier and father is colour blind, 50% of daughters and 50% of sons get colour blindness.
- 4) So, the X-linked characters are inherited by daughters from father, by sons from their mother.