

Previous IPE
SOLVED PAPERS

MARCH -2020 (AP)

PREVIOUS PAPERS**IPE: MARCH-2020(AP)****Time : 3 Hours****SR.ZOOLOGY****Max.Marks : 60****SECTION-A****I. Answer ALL the following VSAQ:****10 × 2 = 20**

1. Name the different types of salivary glands of man and their locations in the human body?
2. Define cardiac cycle and cardiac output.
3. Name two cranial sutures and their locations.
4. What do you know about arbor vitae?
5. Distinguish between diabetes insipidus and diabetes mellitus.
6. Write the names of any four mononuclear phagocytes.
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. What is 'amniocentesis'? Name any two disorders that can be detected by amniocentesis.
9. What is Apiculture?
10. What is popularly called 'Guardian Angel of Cell's Genome'?

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

11. Draw a neat labelled diagram of L.S. of a tooth.
12. Describe disorders of Respiratory system.
13. Write short notes on the ribs of human being.
14. Write short notes on B-Cells.
15. How is sex determined in human beings?
16. (a) Define Biogenetic Law, giving an example.
(b) Define atavism with an example.
17. Write a short on Neo-Darwinism.
18. Discuss in brief about 'Avian Flu'.

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

19. Explain the Physiology of Urine formation.
20. Describe male reproductive system of a man. Draw a labelled diagram of it.
21. What are multiple alleles? Describe multiple alleles with the help of ABO blood groups in man.

IPE AP MARCH-2020

SOLUTIONS

1. Name the different types of salivary glands of man and their locations in the human body?

A: There are 3 pairs of salivary glands in man. [AP 20]

- 1) '**Parotid glands**': These are located below the pinnae (ear lobe)
- 2) '**Submaxillary**' or '**submandibular**' glands: These are located in the corner of lower jaw.
- 3) '**Sub lingual**' glands: These are located below the tongue.

2. Define cardiac cycle and cardiac output.

- A: 1) **Cardiac cycle**: Cardiac events that occur from the beginning of one heartbeat to the beginning of the next is called cardiac cycle. Its duration is about 0.8s.
- 2) **Cardiac output** : It is the volume of blood pumped out by the ventricle per minute. It is approximately 5 litres.

3. Name two cranial sutures and their locations.

- A: 1) Coronal sutures in between frontal bone and parietals.
2) Lambdoid sutures between parietals and occipital bones.

4. What do you know about arbor vitae?

- 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)

5. Distinguish between diabetes insipidus and diabetes mellitus.

Diabetes insipidus	Diabetes mellitus
1) It is characterised by excessive urination and extreme thirst.	1) It is characterised by excess urine with glucose and ketone bodies.
2) It is due to hypo secretion of vasopressin.	2) It is due to hypo secretion of insulin.

6. Write the names of any four mononuclear phagocytes.

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.

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?

- 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.
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8. What is 'amniocentesis'? Name any two disorders that can be detected by amniocentesis.

- 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?

- 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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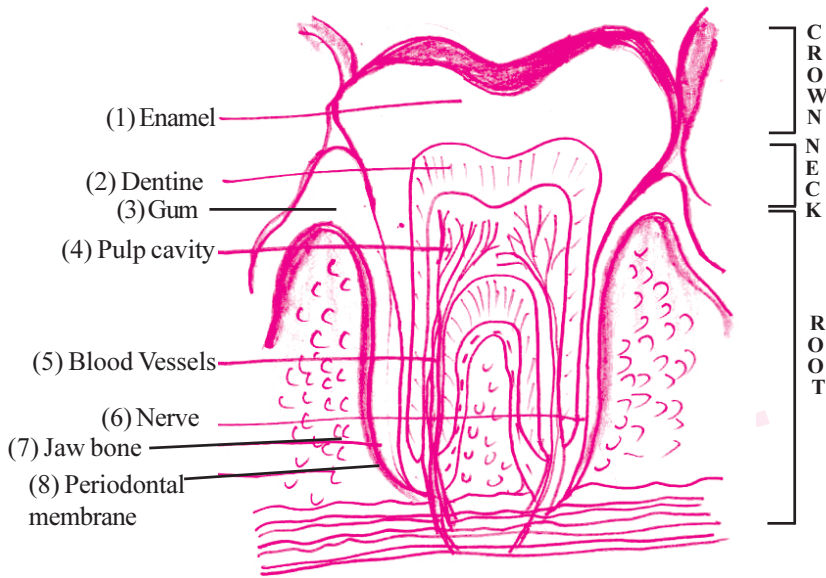
10. What is popularly called 'Guardian Angel of Cell's Genome'?

- A:** 1) P⁵³ gene, is called Guardian Angel of cells Genome, because it guards the integrity of the DNA. It is a tumor suppressing gene
- 2) It stops the cell cycle at '**G₁ check point**' and helps repair the damaged DNA.

SECTION-B

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

A:



L.S. of tooth

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. Write short notes on the ribs of human being.**A: Ribs:**

1. Ribs form the thoracic cage present in the human chest.
2. There are 12 pair of ribs.
3. Dorsally the ribs articulate with vertebral column by two heads and hence called bicephalic (double headed)
4. The first seven pairs are true ribs. Ventrally they are connected to the sternum by hyaline cartilages.
5. 8th, 9th, 10th ribs are connected to cartilage of 7th rib. They are called vertebrochondral ribs.
6. The 11th and 12 pairs are not connected to sterinum. They are called floating ribs.
7. The last five pairs are false ribs (8,9,10,11 &12).
8. Rib cage is formed by thoracic vertebrae, ribs and sternum.

14. Write short notes on B-Cells.**A: B-cells:**

- 1) B-cells are lymphocytes capable of producing antibodies . They can capture circulating antigens.
- 2) They are produced from the bone marrow of adult mammals, and from the **liver of foetus**.
- 3) Mature B cells produce various types of antibodies which are carried on their plasma membrane.
- 4) As these antibodies can take antigens, the mature B cells are also called immuno competent B cells.
- 5) The MBC cells reach secondary lymphoid organs and develop into functional immune cells.
- 6) Functional immune cells transform into long lived memory cells and effector plasma cells.
- 7) Plasma cells produce antibodies specific to antigens.
- 8) Memory cells store information about the specific antigens and show quick response when the same antigen attacks the body infuture.

15. How is sex determined in human beings?**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.pregnancy i.e., to prevent sensitization of mother's immunity system.

16. (a) Define Biogenetic Law, giving an example.**(b) Define atavism with an example.**

A: (a) 1) Biogenetic law (Theory of recapitulation): 'Ontogeny repeats Phylogeny'. This means the developmental history of an organism repeats the evolutionary history of its ancestor.

2) Examples:

- (i) Caterpillar of butterfly resembles an annelid
- (ii) Tadpole larva of frog resembles a fish with a tail and a two chambered heart and gills.

(b) 1)Atavism: Sudden reappearance of some vestigial organs in a better developed condition is called atavism.

2) Ex: Human baby born with tail

17. Write a short on Neo-Darwinism.

A: According to Neo Darwinism theory five basic factors are involved in the process of organic evolution. They are as follows:

- 1) **Gene mutations:** Change in the structure of DNA is called gene mutation or point mutation. Any change in DNA alter the phenotype, to produce variations in offspring.
- 2) **Chromosomal mutations:** Addition, deletion, inversion and translocation of chromosome come under chromosomal mutation. They alter the phenotype.
- 3) **Genetic recombination:** During meiosis exchange of chromosomal bits and genes take place and produce heritable variations.
- 4) **Natural selection:** It favours some variations and rejects other. The selected variations continue in the next generations.
- 5) **Reproductive isolation:** Any reason which stops interbreeding in groups of a population is called reproductive isolations. The groups of a population which do not interbreed with other groups grow into separate species.

18. Discuss in brief about 'Avian Flu'.

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. Explain the physiology of urine formation.

[AP 20]

A: 1) Urine Formation: Kidneys are main excretory organs of human beings.

Urea along with water and other dissolved substances are collectively called urine.

Urine formation involves three processes.

1) Glomerular filtration 2) Selective reabsorption 3) Tubular secretion.

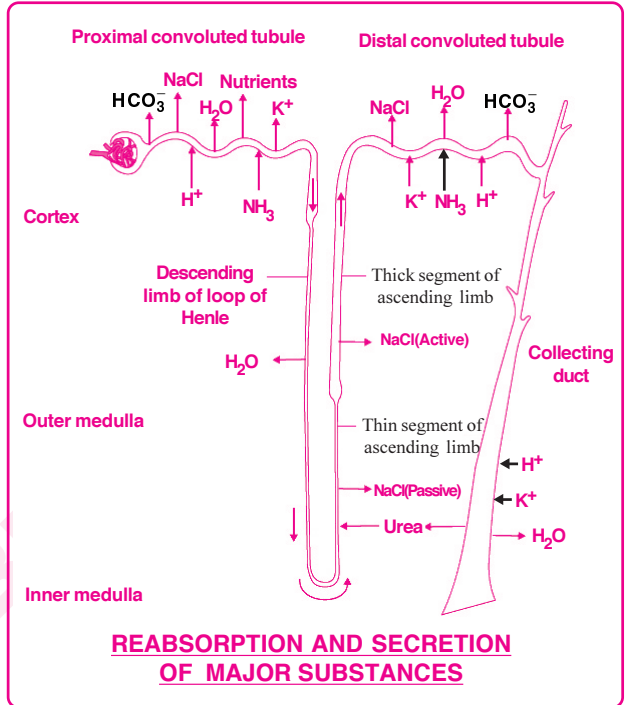
1) Glomerular filtration: Glomerular capillaries along with inner wall of Bowman's capsule form a sieve. The podocytes and slit pores help in this process. **Blood is filtered with a net filtration pressure of 10mm of Hg.**

During this process the entire plasma is filtered except proteins and blood cells.

The filtrate is ultrafiltrate or glomerular filtrate or primary urine.

The glomerular filtration rate in a healthy individual is 125ml/ minute.

2) Selective reabsorption: Nearly 99% of primary urine and essential substances are reabsorbed by renal tubules called selective reabsorption. About 85% of primary urine is reabsorbed in a constant unregulated manner called obligatory reabsorption.



3) Tubular secretion: During the formation of urine, the tubular cells secrete substances such as H^+ , K^+ and NH_3 into the filtrate. Tubular secretion is also an important step in the formation of urine, as it helps in the maintenance of ionic and acid base balance of the body fluids.

II) Mechanism of selective reabsorption- Secretion in different parts of nephrons

1) Proximal convoluted tubule: It is lined by cuboidal epithelium with brush border. About 80% electrolytes and water are reabsorbed. Water is absorbed by passive diffusion (osmosis) and Na^+ , glucose, amino acids and other essential substances by active transport. H^+ and NH_3 are secreted. HCO_3^- is absorbed to maintain pH.

2) Henle's loop: Water reabsorbed in descending limb by diffusion. Ascending limb has a thin segment and thick segment. $NaCl$ is reabsorbed passively in thin part and actively in thick part. In Henle's loop, low osmolarity (300) is maintained towards cortex and high osmolarity (1200) at the tip in medulla.

The counter flow of blood through vasa recta removes water, $NaCl$ and reabsorbed substances continuously.

3) Distal Convoluted Tubule(DCT): Water is reabsorbed by the action of ADH (Anti diuretic hormone). HCO_3^- is absorbed. H^+ , K^+ and NH_3 are secreted to maintain pH.

4) Collecting Ducts(CD): This segment allows the passage of small amount of urea to keep up its osmolarity. Concentrated urine is released into pelvis. It is hypertonic to the plasma of blood.

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

A: MALE REPRODUCTIVE SYSTEM

[AP 16,17,18,20][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
 - (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.

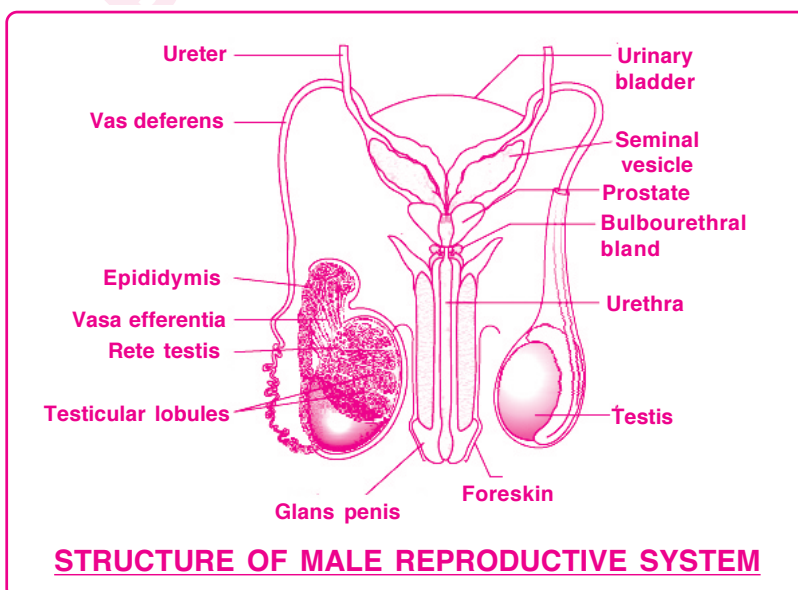
VI) Male accessory genital glands:**(1) Seminal vesicles:**

- (i) A pair of simple tubular glands is present below the urinary bladder. Each seminal vesicle opens into the corresponding vas deferens.
- (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**.



21. What are multiple alleles? Describe multiple alleles with the help of ABO blood groups in man.

A: I) Multiple alleles: Generally a gene has two alleles, one dominant and other recessive. Sometimes a gene may have more than two alleles which are called multiple alleles.

The **number of Genotypes** for multiple alleles can be known by the formula $\frac{n(n+1)}{2}$, where n is the number alleles.

Ex: ABO blood groups.

There are 3 alleles for a single gene.

$$\therefore \text{No. of zenyotypes} = \frac{n(n+1)}{2} = \frac{3(3+1)}{2} = \frac{3(4)}{2} = 6$$

II) ABO Blood Groups:

The **four Blood groups A,B,AB, O** types are characterized by the presence or absence of antigens on the plasma membrane of RBCs.

The Antigens are sugar polymers. These are bound to lipid molecules.

Blood group A persons have antigen 'A' on their RBCs and anti-B antibodies in the plasma.

Blood group B persons have antigen 'B' on their RBCs and anti-A antibodies in the plasma.

Blood group AB persons have antigens 'A' and 'B' on the RBCs and 'no anti-A and anti-B antibodies' in the plasma.

Blood group O persons have 'no antigens' on their RBCs and both 'anti-A' and 'anti-B' antibodies in the plasma

III) Genetic basis:

- 1) **Karl Land Steiner** proposed the ABO system of blood groups.
- 2) Genetic basis of ABO Blood group is mainly dependent on **3 alleles I^A, I^B and I^O** (or i) of the gene I located on **chromosome 9**.
- 3) Alleles I^A and I^B produce antigen A and antigen B respectively.
- 4) Allele I^O does not produce any antigens.
- 5) Allele I^A and I^B are dominant over I^O but codominant to each other
- 6) A child receives one of the three alleles from each parent, giving rise to six possible genotypes and four possible blood types.
- 7) The 6 genotypes are as follows:

(i) $I^A I^A$	(ii) $I^A I^O$	(iii) $I^B I^B$	(iv) $I^B I^O$	(v) $I^A I^B$	(vi) $I^O I^O$
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- 8) The four Phenotypes are as follows:

(i) $I^A I^A$ and $I^A I^O$ are A group blood	(ii) $I^B I^B$ and $I^B I^O$ are B group blood
(iii) $I^A I^B$ are AB group blood	(iv) $I^O I^O$ are O group blood

IV) Compatibility:

- 1.1) A^+ group can receive blood from A^+ , A^- and O^- groups.
- 1.2) A^- group can receive blood from A^- and O^- groups.
- 2.1) B^+ group can receive blood from B^+ , B^- and O^- group.
- 2.2) B^- group can receive blood from B^- and O^- groups.
- 3.1) AB^+ can receive from all other groups. Hence **AB^+ is called universal recipient.**
- 3.2) AB^- can receive from A^- , B^- , AB^- and O^- groups.
- 4.1) O^+ can receive blood only from O^+ and O^- groups.
- 4.2) O^- can receive blood only from O^- but not from any other group.
 O^- can be transfused to any other group. Hence **O^- is called universal donor.**