

SURA'S

# BIO-ZOOLOGY & ZOOLOGY

(SHORT VERSION AND LONG VERSION)

12<sup>th</sup> Standard

Public Exam  
Edition 2021-22

Strictly as per the Reduced (Prioritised) Syllabus released on  
13th August, 2021 (G.O.(Ms).No126)

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**Class: 12 .....Subject: Bio-Zoology (Theory)**

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## ZOOLOGY LONG VERSION

(FOR PURE SCIENCE GROUP)

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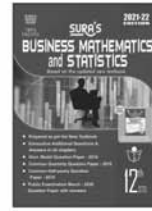
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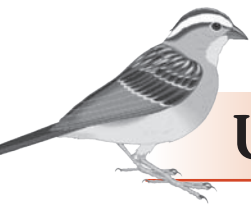
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## UNIT I

## Chapter

## 1

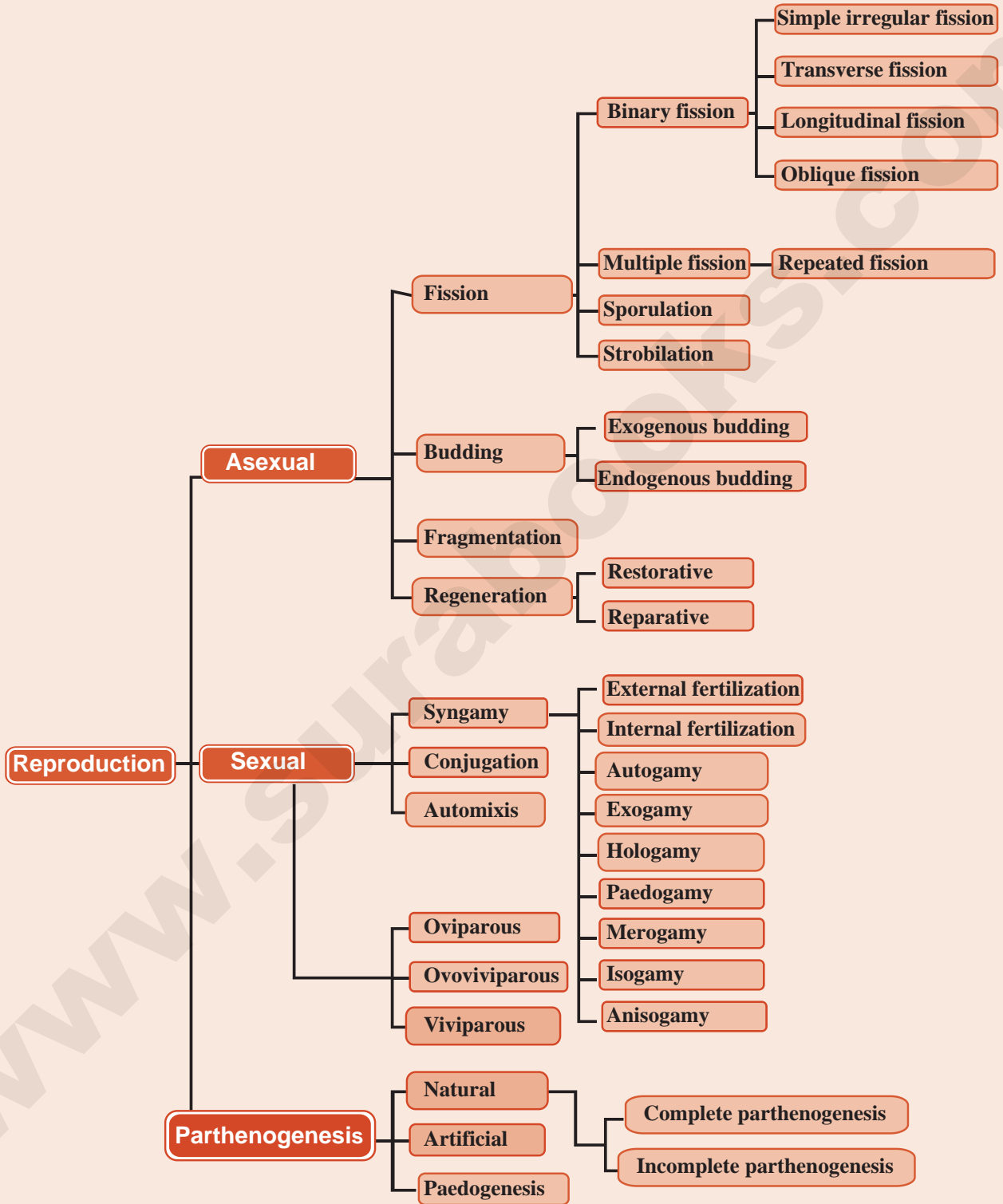
# REPRODUCTION IN ORGANISMS

### MUST KNOW DEFINITIONS

|                                 |   |   |
|---------------------------------|---|---|
| <b>Asexual reproduction</b>     | : | Reproduction by single parent involving amitotic or mitotic divisions only.   |
| <b>Sexual reproduction</b>      | : | Participation of two individuals and involves formation of male and female gamete.  |
| <b>Fission</b>                  | : | Division of parent body into two or more identical Daughter individuals.  |
| <b>Binary fission</b>           | : | Parent organism divides into two daughter cells.  |
| <b>Multiple fission</b>         | : | Parent body divides into many similar daughter cells.   |
| <b>Strobilation</b>             | : | A special type of transverse fission giving rise to number of individuals.  |
| <b>Budding</b>                  | : | Parent body produces one or more buds which separate from the parent and lead an independent life   |
| <b>Gemmule</b>                  | : | Internal buds formed in sponge which can tolerate adverse conditions and are a means of asexual reproduction.                                 |
| <b>Apoecy</b>                   | : | Separation of gravid proglottids from the body of a tape worm.  |
| <b>Regeneration</b>             | : | Regrowth in the injured region.   |
| <b>External fertilization</b>   | : | Fusion of male & female gametes takes place outside the body of the female organism.  |
| <b>Internal fertilization</b>   | : | Fusion of male and female gametes takes place within the body of the female organism.   |
| <b>Fertilization</b>            | : | Fusion of male & female gametes.  |
| <b>Conjugation</b>              | : | Type of sexual reproduction between two individuals, where certain amount of nuclear material exchange takes place after which they separate. |
| <b>Parthenogenesis</b>          | : | Development of an egg into a complete individual without fertilization.   |
| <b>Oviparous condition</b>      | : | Young ones hatch from eggs laid outside the mother's body.  |
| <b>Viviparous condition</b>     | : | Animals give birth to young ones.   |
| <b>Ovoviviparous conditions</b> | : | Embryo develops inside the eggs and remains in the mother's body until they are ready to hatch.   |



Concept Map





## Evaluation

1. In which type of parthenogenesis are only males produced? [QY-2019]

- (a) Arrhenotoky (b) Thelytoky  
(c) Amphitoky (d) Both a and b

[Ans. (a) Arrhenotoky]

2. The mode of reproduction in bacteria is by

- (a) Formation of gametes  
(b) Endospore formation  
(c) Conjugation  
(d) Zoospore formation

[Ans. (c) Conjugation]

3. In which mode of reproduction variations are seen

- (a) Asexual (b) Parthenogenesis  
(c) Sexual (d) Both a and b

[Ans. (c) Sexual]

4. Assertion and reasoning questions:

In each of the following questions there are two statements. One is assertion (A) and other is reasoning (R). Mark the correct answer as

- A. If both A and R are true and R is correct explanation for A.  
B. If both A and R are true but R is not the correct explanation for A.  
C. If A is true but R is false.  
D. If both A and R are false.

I. **Assertion:** In bee society, all the members are diploid except drones.

**Reason:** Drones are produced by parthenogenesis.

A B C D

[Ans. (A) Both A and R are true and R is correct explanation for A]

5. Name an organism where cell division is itself a mode of reproduction.

Ans. Bacteria, Amoeba.

6. Name the phenomenon where the female gamete directly develops into a new organism with an avian example.

Ans. Phenomenon – Parthenogenesis

Eg: Turkey.

7. What is Parthenogenesis? Give two examples from animals. [QY-2019]

Ans. (i) Development of an egg into a complete individual without fertilization is known as parthenogenesis.

(ii) Parthenogenesis is of two main types namely, **Natural Parthenogenesis** and **Artificial Parthenogenesis**.

(iii) Ex: Honey bees, Gall fly.

8. Which type of reproduction is effective - Asexual or sexual and why? (OR) Why sexual method of reproduction is better than asexual reproduction? [PTA-5]

Ans. (i) Sexual reproduction produces variation in the offspring, chances of having genes of both the parents whereas in an asexual reproduction, there is no variation, the offspring will be identical to only one of the parent.

(ii) Thus sexual reproduction is said to be more effective than asexual reproduction.

9. Give reasons for the following: [Sep. 2020]

(a) Some organisms like honey bees are called parthenogenetic animals.

(b) A male honey bee has 16 chromosomes where as its female has 32 chromosomes.

Ans. (a) Development of an egg into a complete individual without fertilization is known as parthenogenesis. It is of two types.

(i) Natural parthenogenesis occurs in Nature in many animals such as honey bees.

(ii) Artificially it can be induced in animals by physical or chemical stimuli which is called artificial parthenogenesis.

(b) In honey bees, both sexual reproduction and parthenogenesis occurs, and it is described as incomplete parthenogenesis.

During sexual reproduction, the fertilized eggs (zygotes) develop into queen bee and workers (females). The unfertilized eggs develop into drones (males). Thus honey bees are called parthenogenetic animals.

In honey bees, the normal chromosomal number in a cell is  $2n = 32$ . Gametes (sperms & egg) will have only  $n = 16$  chromosomes since they are haploid.

The female bees are formed by fertilization of gametes.

$$\text{sperm } (n) + \text{egg } (n) = 2n$$

Therefore they have 32 chromosomes. Since the drones (males) are formed from unfertilized eggs( $n$ ) they have only 16 chromosomes.

10. How is Juvenile phase different from reproductive phase?

Ans.

| Juvenile phase   | Reproductive phase  |
|--|---|
| Juvenile phase/ vegetative phase is the period of growth between the birth of the individual upto reproductive maturity. | During reproductive phase/ maturity phase the organisms reproduce and their offsprings reach maturity period. |

11. What is the difference between syngamy and fertilization?

Ans.

| Syngamy   | Fertilization  |
|---|--|
| Process of fusion of two gametes to form zygote.  | It refers to the act or process of rendering fertile.  |
| Classified into many types <ul style="list-style-type: none"> <li>• Autogamy</li> <li>• Exogamy</li> <li>• Hologamy</li> <li>• Paedogamy</li> <li>• Merogamy</li> <li>• Isogamy</li> <li>• Anisogamy</li> </ul> | Classified into two types of fertilization, <ul style="list-style-type: none"> <li>• External Fertilization</li> <li>• Internal Fertilization</li> </ul> |

## ZOOLOGY LONG VERSION QUESTIONS (FOR PURE SCIENCE GROUP)

Q.No. 1 to 8 Refer Evaluation.

9. Why are the offsprings of oviparous animal at a greater risk as compared to offsprings of viviparous organisms?

Ans. Oviparous animals lay eggs outside their body. These eggs are exposed to various environmental conditions and may be eaten by predators also. They face lot of risks until the young ones hatch. But the offsprings of viviparous animals are more safe and protected in the maternal womb until they are born.

10. Refer Evaluation Q.No.9

11. Refer Evaluation Q.No.10

12. Refer Evaluation Q.No.11

### PTA Question & Answers

CHOOSE THE CORRECT ANSWER 1 Mark

1. Human beings are unisexual animals, the type of syngamy in human beings is [PTA-3]

- (a) autogamy
- (b) exogamy
- (c) hologamy
- (d) paedogamy

[Ans. (a) autogamy]

### VERY SHORT ANSWERS

2 Marks

1. Why do we call parthenogenesis as a special type of sexual reproduction in animals?

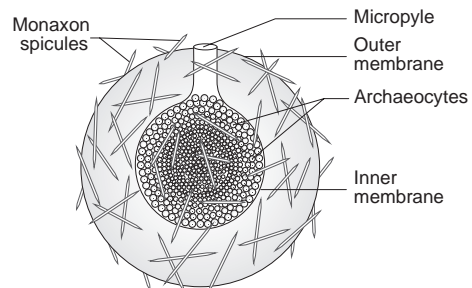
[PTA-4]

Ans. (i) Development of an egg into a complete individual without fertilization is known as parthenogenesis.

(ii) Parthenogenesis is the special type of sexual reproduction seen in animals. It is of two main types namely natural parthenogenesis and artificial parthenogenesis.

2. Draw the diagram of a gemmule and label the parts. [PTA-3]

Ans.



Gemmule in sponges



SHORT ANSWERS

3 Marks

1. Meiosis cell division does not take place during the gametes formation of drone bees. Give reason. [PTA-2]

**Ans. (i)** Drones are produced by parthenogenesis, unfertilized eggs develop into drone bees (males).

**(ii)** Males have the half the number of chromosomes (haploid). Thus meiosis cell division does not take place during the gametes formation of drone bees.

GOVERNMENT EXAM QUESTIONS

Bio-Zoology (Short version)

CHOOSE THE CORRECT ANSWER 1 Mark

1. Which among the following animals exhibit ovoviviparity? [Govt.MQP-2019]

- (a) frog
- (b) shark
- (c) sheep
- (d) hen

**[Ans. (b) shark]**

Zoology (Long version)

CHOOSE THE CORRECT ANSWER 1 Mark

1. Paedogenetic Parthenogenesis occurs in :

[Mar-2020]

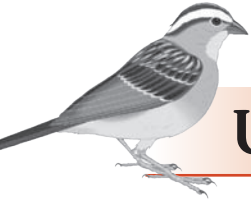
- (a) Aphis
- (b) Honey bees
- (c) Solenobia
- (d) Gall fly

**[Ans. (d) Gall fly]**

2. Which one of the following is true regarding binary fission in Paramecium? [Sep. 2020]

- (a) Macronucleus divides by mitosis and the micronucleus divides by amitosis.
- (b) Macronucleus divides by amitosis and the micronucleus divides by mitosis.
- (c) Macronucleus and micronucleus divide by amitosis.
- (d) Micronucleus and macronucleus divide by mitosis.

**[Ans. (b) Macronucleus divides by amitosis and the micronucleus divides by mitosis.]**



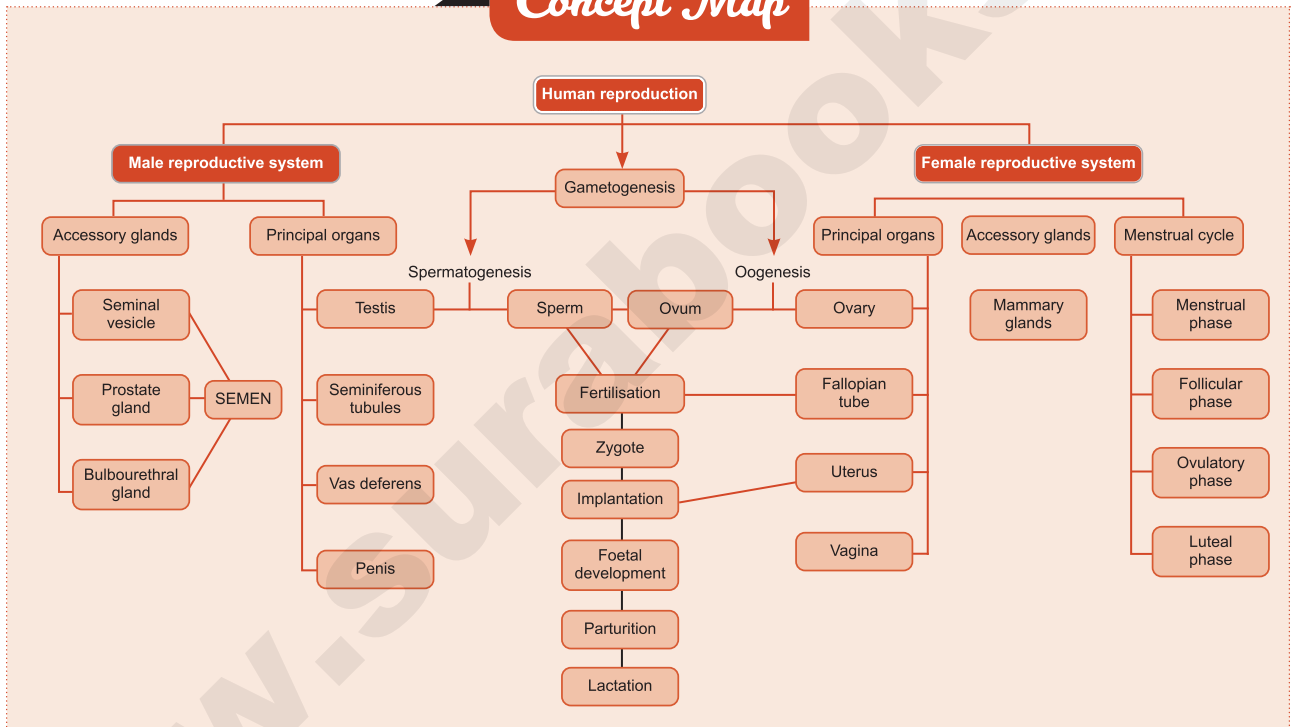
UNIT I

Chapter

2

# HUMAN REPRODUCTION

## Concept Map







## MUST KNOW DEFINITIONS

|                          |  |
|--------------------------|--|
| <b>Gametogenesis</b>     | : Formation of gametes by spermatogenesis and oogenesis.   |
| <b>Insemination</b>      | : Transfer of sperms by the male into the female genital tract.  |
| <b>Fertilization</b>     | : Fusion of male and female gametes to form zygote is called fertilization.  |
| <b>Cleavage</b>          | : Rapid mitotic divisions of the zygote which convert the single celled zygote into a multicellular structure called blastocyst.               |
| <b>Implantation</b>      | : Attachment of blastocyst to the uterine wall.  |
| <b>Placentation</b>      | : Formation of placenta which is the intimate connection between foetus and uterine wall of the mother for exchange of nutrients.              |
| <b>Gastrulation</b>      | : Process by which blastocyst is changed into a gastrula with three primary germ layers  |
| <b>Organogenesis</b>     | : Formation of specific tissues, organs and organ systems from three germ layers.  |
| <b>Parturition</b>       | : Expulsion of the foetus from the mother's womb.  |
| <b>Sertoli cells</b>     | : Elongated and pyramidal cells which provide nourishment to sperms till maturation.   |
| <b>Semen</b>             | : Milky white fluid which contains sperms & seminal plasma   |
| <b>Fallopian tube</b>    | : Oviduct or uterine tube which receives the egg after ovulation   |
| <b>Uterus</b>            | : Hollow, thick - walled, inverted pear shaped structure in female reproductive system in which implantation of embryo occurs.                 |
| <b>Mammary glands</b>    | : Modified sweat glands involved in lactation in females and rudimentary in males.   |
| <b>Spermatogenesis</b>   | : Process of formation of sperms in seminiferous tubules of testis   |
| <b>Oogenesis</b>         | : Process of development of ovum in the ovaries  |
| <b>Spermiogenesis</b>    | : The spermatids are transformed into mature sperms by the process of spermiogenesis.  |
| <b>FSH</b>               | : Follicle stimulating hormone produced by the pituitary gland   |
| <b>LH</b>                | : Lutenizing Hormone produced by the pituitary gland   |
| <b>ABP</b>               | : Androgen Binding protein   |
| <b>Acrosome</b>          | : Pointed structure at the tip of the sperm head.  |
| <b>Hyaluronidase</b>     | : Proteolytic enzyme produced by acrosome of sperm,  |
| <b>Menstrual cycle</b>   | : Ovarian cycle occurring once in every 28/29 days during reproductive life of female from menarche to menopause except during pregnancy.      |
| <b>Graafian follicle</b> | : Mature ovarian follicle which releases the egg.  |
| <b>Corpus luteum</b>     | : Temporary endocrine gland formed from ruptured graafian follicle during pregnancy.   |
| <b>Placenta</b>          | : Disc shaped temporary endocrine organ formed during pregnancy which connects foetus and uterine wall.  |
| <b>Gastrulation</b>      | : The transformation of the blastocyst into a gastrula with the primary germ layers by the movement of the blastomeres is called gastrulation. |
| <b>Gestation</b>         | : Period for which the foetus is in the mother's womb.   |
| <b>hCS</b>               | : Human Chorionic Somatomammotropin  |
| <b>hCG</b>               | : Human Chorionic Gonadotropin   |
| <b>hPL</b>               | : Human Placental Lactogen   |
| <b>Polyspermy</b>        | : Entry of more than one sperm into the ovum.  |

## Evaluation

- The mature sperms are stored in the  
 (a) Seminiferous tubules (b) Vas deferens  
 (c) Epididymis (d) Seminal vesicle  
**[Ans. (c) Epididymis]**
- The male sex hormone testosterone is secreted from  
 (a) Sertoli cells (b) Leydig cell  
 (c) Epididymis (d) Prostate gland  
**[Ans. (b) Leydig cell]**
- The glandular accessory organ which produces the largest proportion of semen is  
 (a) Seminal vesicle  
 (b) Bulbourethral gland  
 (c) Prostate gland  
 (d) Mucous gland **[Ans. (a) Seminal vesicle]**
- The male homologue of the female clitoris is  
 (a) Scrotum (b) Penis  
 (c) Urethra (d) Testis  
**[Ans. (b) Penis]**
- The site of embryo implantation is the  
 (a) Uterus (b) Peritoneal cavity  
 (c) Vagina (d) Fallopian tube  
**[Ans. (a) Uterus]**
- The foetal membrane that forms the basis of the umbilical cord is  
 (a) Allantois (b) Amnion  
 (c) Chorion (d) Yolk sac  
**[Ans. (a) Allantois]**
- The process which the sperm undergoes before penetrating the ovum is  
 (a) Spermiation (b) Cortical reaction  
 (c) Spermiogenesis (d) Capacitation  
**[Ans. (d) Capacitation]**
- The Androgen Binding Protein (ABP) is produced by  
 (a) Leydig cells (b) Hypothalamus  
 (c) Sertoli cells (d) Pituitary gland  
**[Ans. (c) Sertoli cells]**
- Find the wrongly matched pair *[Sep. 2020]*  
 (a) Bleeding phase - fall in oestrogen and progesterone  
 (b) Follicular phase - rise in oestrogen  
 (c) Luteal phase - rise in FSH level  
 (d) Ovulatory phase - LH surge  
**[Ans. (c) Luteal phase - Rise in FSH level]**

Answer the following type of questions Assertion (A) and Reason (R)

- A and R are true, R is the correct explanation of A
  - A and R are true, R is not the correct explanation of A
  - A is true, R is false
  - Both A and R are false
- A - In human male, testes are extra abdominal and lie in scrotal sacs.  
 R - Scrotum acts as thermoregulator and keeps temperature lower by 2°C for normal sperm production .  
**[Ans. (a) A and R are true, R is the correct explanation of A]**
  - A - Head of the sperm consists of acrosome and mitochondria.  
 R - Acrosome contains spiral rows of mitochondria.  
**[Ans. (d) Both A and R are false]**
  - Mention the differences between spermiogenesis and spermatogenesis.

Ans.

| Spermiogenesis  | Spermatogenesis  |
|---|--|
| It is the process of maturation of spermatids into spermatozoa.   | It is the process of formation of sperm cells or male gametes.   |
| Follicle Stimulating Hormone (FSH) stimulate testicular growth and enhances the production of Androgen Binding Protein (ABP) by the sertoli cells and helps in the process of spermiogenesis. | Lutenizing Hormone (LH) acts on the Leydig cells and stimulates the synthesis of testosterone which in turn stimulates the process of spermatogenesis. |

- At what stage of development are the gametes formed in new born male and female?

- Ans. (i) In a new born male, spermatogenesis (formation of sperms) starts at the age of puberty. It is initiated due to the increase in the release of Gonadotropin Releasing hormone.
- (ii) Oogenesis is the process of development of the female gamete or egg in the ovaries.



During foetal development, certain cells in the germinal epithelium of foetal ovary divide by mitosis and produce millions of oogonia or egg mother cells.

- (iii) No more oogonia are added after birth. The oogonial cells enter into prophase I of meiosis to form primary oocytes which are temporarily arrested at this stage.
- (iv) The primary oocytes then become primary follicles. From birth to puberty, a large number of follicles degenerate. At puberty the primary follicle undergoes further development and finally releases the ovum.

**14. Expand the acronyms**

- a. FSH    b. LH    c. hCG    d. hPL

- Ans.** (a) FSH – Follicular Stimulating Hormone  
 (b) LH – Leutinising Hormone  
 (c) hCG – Human Chorionic Gonadotropin  
 (d) hPL – Human Placental Lactogen.

**15. How is polyspermy avoided in humans?**

- Ans.** Once fertilization is accomplished, cortical granules from the cytoplasm of the ovum form a barrier called the fertilization membrane around the ovum. This prevents further penetration of other sperms. Thus polyspermy (entry of more than one sperm into an egg) is prevented.

**16. Placenta is an endocrine tissue. Justify.**

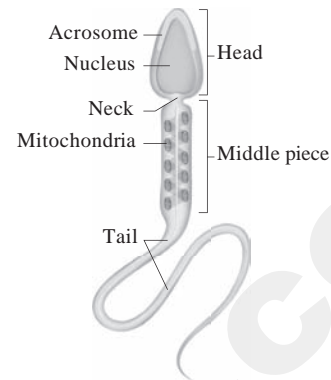
[Mar-2020]

- Ans. (i)** Placenta is a temporary endocrine organ formed during pregnancy.  
**(ii)** During pregnancy, the placenta acts as a temporary endocrine gland and produces large quantities of human Chorionic Gonadotropin (hCG), human Chorionic Somatomammotropin (hCS) or human Placental Lactogen (hPL), oestrogens and progesterone which are essential for a normal pregnancy.  
**(iii)** A hormone called relaxin is also secreted during the later phase of pregnancy which helps in relaxation of the pelvic ligaments at the time of parturition.  
**(iv)** hCG, hPL and relaxin are produced only during pregnancy. Thus placenta is an endocrine tissue.

**17. Draw a labeled sketch of a spermatozoan.**

[Sep-2020]

**Ans.**



**18. What is Inhibin? State its functions.**

- Ans.** **Inhibin** is a hormone secreted by the sertoli cells in the stratified epithelium of the seminiferous tubule in the testis.

**Function:** It is involved in the negative feedback control of sperm production.

**19. Mention the importance of the position of the testes in humans.**

- Ans. (i)** Testes are the primary male sex organs.  
**(ii)** They are a pair of ovoid bodies lying in the scrotum.  
**(iii)** The scrotum is a sac of skin that hangs outside the abdominal cavity.  
**(iv)** Tests are important for the production and storage of sperm. Since viable sperms cannot be produced at normal body temperature, the scrotum is placed outside the abdominal cavity to provide a temperature 2-3°C lower than the normal internal body temperature. Thus, the scrotum acts as a thermoregulator for spermatogenesis.

**20. What is the composition of semen?**

- Ans. (i)** Semen is a milky white fluid which contains sperms and the seminal plasma.  
**(ii)** The seminal plasma contains fructose sugar, ascorbic acid, prostaglandins and a coagulating enzyme called **vesiculase** which enhance sperm mobility.  
**(iii)** It also contains citrate, several enzymes and prostate specific antigens.  
**(iv)** It also provides nutrients and contains chemicals that protect and activate the sperms.

**21.** Name the hormones produced from the placenta during pregnancy.

**Ans.** Hormones produced by the placenta during pregnancy are:

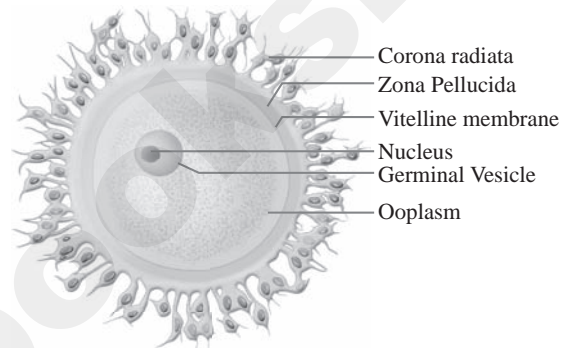
- (i) human Chorionic Gonadotropin (hCG)
- (ii) human Chorionic Somatomammotropin (hCS)
- (iii) human Placental Lactogen (hPL)
- (iv) Oestrogens
- (v) Progesterone
- (vi) Relaxin

**22.** Define Gametogenesis.

**Ans.** Gametogenesis is the process of formation of gametes i.e., sperms and ovary from the primary sex organs in all sexually reproducing organisms. Meiosis plays the most significant role in the process of gametogenesis.

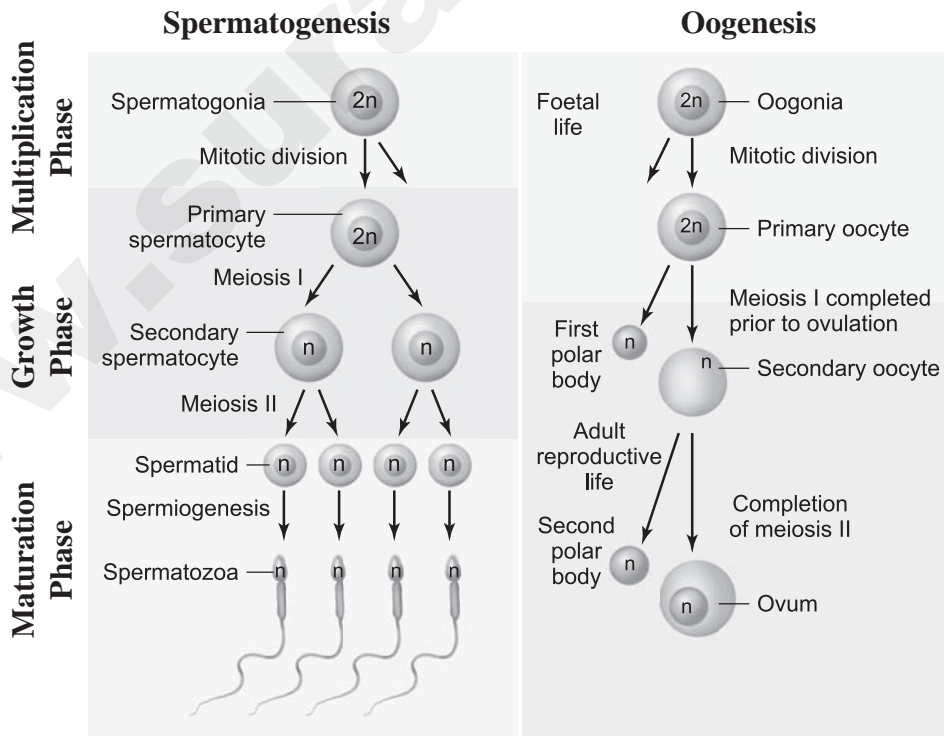
**23.** Describe the structure of the human ovum with a neat labelled diagram. [Sep-2020]

- Ans. (i)** Human ovum is non-cleidoic, alecithal and microscopic in nature.
- (ii)** Its cytoplasm is called Ooplasm contains a large nucleus called the germinal vesicle.
- (iii)** The ovum is surrounded by three coverings namely an inner thin transparent vitelline membrane, middle thick zona pellucida and outer thick coat of follicular cells called corona radiata.
- (iv)** Between the vitelline membrane and zona pellucida is a narrow perivitelline space.



**24.** Give a schematic representation of Spermatogenesis and Oogenesis in humans. [PTA-1; QY-2019]

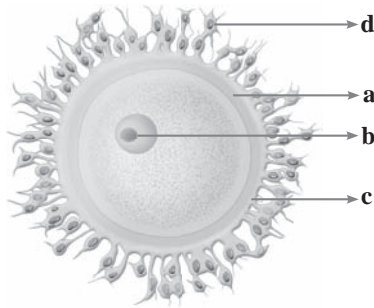
**Ans.**







25. Identify the given image and label its parts marked as a, b, c and d



**Ans.** Human Ovum  
 a – Vitelline membrane  
 b – Nucleus  
 c – Zona Pellucida  
 d – Corona radiata

### PTA Question & Answers

CHOOSE THE CORRECT ANSWER **1 Mark**

1. The right order of reproductive events in human being is \_\_\_\_\_. [PTA-3]

- (a) Gametogenesis → fertilization → blastocyst → gastrulation → organogenesis → parturition
- (b) Gametogenesis → Cleavage → gastrulation → blastocyst → organogenesis → parturition
- (c) Gametogenesis → fertilization → blastocyst → Cleavage → gastrulation → parturition → organogenesis
- (d) Gametogenesis → fertilization → Cleavage → organogenesis → blastocyst → gastrulation → parturition

**[Ans. (d) Gametogenesis → fertilization → Cleavage → organogenesis → blastocyst → gastrulation → parturition]**

2. Which one of the following is an incorrect statement regarding uterus? [PTA-4]

- (a) It is an inverted pear shaped structure
- (b) It lies between urinary bladder and rectum
- (c) The uterus opens into the vagina through fundus
- (d) The wall of uterus has three layers.

**[Ans. (c) The uterus opens into the vagina through fundus]**

VERY SHORT ANSWERS **2 Marks**

1. Scrotum acts as a thermo regulator for spermatogenesis. Why? [PTA-1]

- Ans. (i)** Since viable sperms cannot be produced at normal body temperature, the scrotum is placed outside the abdominal cavity to provide a temperature 2-3°C lower than the normal internal body temperature.
- (ii)** Thus, the scrotum acts as a thermoregulator for spermatogenesis.

SHORT ANSWERS **3 Marks**

1. Explain the penetration mechanism of a sperm into an egg. [PTA-3]

- Ans. (i)** The sperms deposited in the female reproductive tract undergo capacitation, which is a biochemical event that enables the sperm to penetrate and fertilise the egg.
- (ii)** Fertilization occurs only if the ovum and sperms are transported simultaneously to the ampullary isthmus junction of the fallopian tube.
- (iii)** Before a sperm can enter the egg, it must penetrate the multiple layers of granulosa (follicular) cells which are around the ovum forming the corona radiata.
- (iv)** The acrosomal membrane disintegrates releasing the proteolytic enzyme, hyaluronidase during sperm entry through the corona radiata and zona pellucida. This is called acrosomal reaction.
- (v)** Once fertilization is accomplished, cortical granules from the cytoplasm of the ovum form a barrier called the fertilization membrane around the ovum preventing further penetration of other sperms.

LONG ANSWERS **5 Marks**

1. Explain the role of hormones in the maintenance of human male fertility. [PTA-2]

- Ans. (i)** Spermatogenesis starts at the age of puberty and is initiated due to the increase in the release of Gonadotropin Releasing Hormone (GnRH) by the hypothalamus.



- (ii) GnRH acts on the anterior pituitary gland and stimulates the secretion of two gonadotropins namely Follicle Stimulating Hormone (FSH) and Lutenizing Hormone (LH).
- (iii) FSH stimulates testicular growth and enhances the production of Androgen Binding Protein (ABP) by the sertoli cells and helps in the process of spermiogenesis.
- (iv) LH acts on the Leydig cells and stimulates the synthesis of testosterone which in turn stimulates the process of spermatogenesis.

**2. Explain the role of placenta during pregnancy.**

[PTA-4]

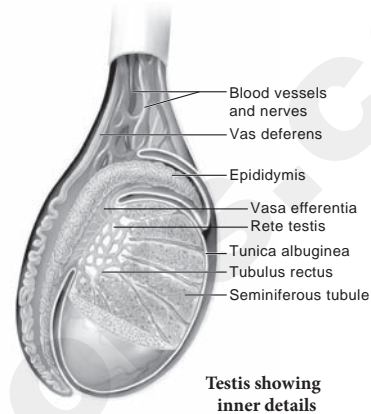
- Ans. (i)** During pregnancy, the placenta acts as a temporary endocrine gland and produces large quantities of human Chorionic Gonadotropin (hCG), human Chorionic Somatomammotropin (hCS) or human Placental Lactogen (hPL), oestrogens and progesterone which are essential for a normal pregnancy.
- (ii) A hormone called relaxin is also secreted during the later phase of pregnancy which helps in relaxation of the pelvic ligaments at the time of parturition.
  - (iii) It should be noted that hCG, hPL and relaxin are produced only during pregnancy.
  - (iv) In addition, during pregnancy the level of other hormones like oestrogen and progesterone, cortisol, prolactin, thyroxine, etc., is increased several folds in the maternal blood.
  - (v) These hormones are essential for supporting foetal growth.

**3. Explain the anatomy of testis with the help of a diagram.**

[PTA-5]

- Ans. (i)** Testes are the primary male sex organs. They are a pair of ovoid bodies lying in the scrotum.
- (ii) The scrotum is a sac of skin that hangs outside the abdominal cavity.
  - (iii) Since viable sperms cannot be produced at normal body temperature, the scrotum is placed outside the abdominal cavity to provide a temperature 2-3°C lower than the normal internal body temperature.
  - (iv) Thus, the scrotum acts as a thermoregulator for spermatogenesis.

- (v) Each testis is covered by an outermost fibrous tunica albuginea and is divided by septa into about 200 - 250 lobules each containing 2-4 highly coiled testicular tubules or seminiferous tubules.
- (vi) These highly convoluted tubules which form 80 percent of the testicular substance are the sites for sperm production.



**4. Briefly explain the mechanism of fertilization and implantation in human beings.**

[PTA-6; Sep-2020]

- Ans. (i)** Fertilization occurs when a haploid sperm fuses with a haploid ovum to form a fertilized egg or diploid zygote.
- (ii) The sperms deposited in the female reproductive tract undergo capacitation, which is a biochemical event that enables the sperm to penetrate and fertilise the egg.
  - (iii) Fertilization occurs only if the ovum and sperms are transported simultaneously to the ampullary isthmic junction of the fallopian tube.
  - (iv) Before a sperm can enter the egg, it must penetrate the multiple layers of granuloosa (follicular) cells which are around the ovum forming the corona radiata. The follicular cells are held together by an adhesive cementing substance called hyaluronic acid.
  - (v) The acrosomal membrane disintegrates releasing the proteolytic enzyme, hyaluronidase during sperm entry through the corona radiata and zona pellucida. This is called acrosomal reaction.



- (vi) Once fertilization is accomplished, cortical granules from the cytoplasm of the ovum form a barrier called the fertilization membrane around the ovum preventing further penetration of other sperms. Thus polyspermy is prevented.
- (vii) The first cleavage produces two identical cells called blastomeres. These produce 4 cells, then 8 and so on. After 72 hours of fertilization, a loose collection of cells forms a berry shaped cluster of 16 or more cells called the morula.
- (viii) By progesterone, smooth muscles of the fallopian tube relax and the dividing embryo takes 4-5 days to move through the fallopian tube into the uterine cavity and finally gets implanted in the uterine wall.
- (ix) The inner cell mass of the blastocyst develops into the embryo and becomes embedded in the endometrium of the uterus.
- (x) This process is called implantation and it results in pregnancy.
- (xi) If the fertilised ovum is implanted outside the uterus it results in ectopic pregnancy.

### GOVERNMENT EXAM QUESTIONS

### Bio-Zoology (Short version)

#### CHOOSE THE CORRECT ANSWER ||| 1 Mark |||

1. Which of the following is not belonging to the accessory glands of the male reproductive system? [QY-2019]
  - (a) Prostate gland
  - (b) Corpus albicans
  - (c) Cowper's gland
  - (d) Bulbourethral glands

**[Ans. (c) Cowper's gland]**
2. World Breast feeding week is observed during: [HY-2019]
  - (a) March 1<sup>st</sup> week
  - (b) December 1<sup>st</sup> week
  - (c) August 1<sup>st</sup> week
  - (d) July 1<sup>st</sup> week

**[Ans. (c) August 1<sup>st</sup> week]**

3. Which one of the following is true to gastrulation? [Mar-2020]

- (a) Formation of multicellular structure from Zygote.
- (b) Formation of specific organs from germ layers.
- (c) Formation of three germ layer embryo from single layer embryo.
- (d) Attachment of blastocyst to the uterine wall.

**[Ans. (c) Formation of three germ layer embryo from single layer embryo]**

5. The Skene's glands of female are homologous to : [Sep. 2020]

- (a) Bulbourethral glands of the male
- (b) Cowper's gland of male
- (c) Prostate gland of male
- (d) Glans penis of male

**[Ans. (c) Prostate gland of male]**

6. The function of androgen binding protein is : [Sep. 2020]

- (a) Ejaculation of sperms
- (b) Process of a spermiogenesis
- (c) Stimulates the synthesis of inhibin
- (d) Inhibiting the release of FSH

**[Ans. (b) Process of a spermiogenesis]**

#### VERY SHORT ANSWERS

**2 Marks**

1. Describe the structure of the head of a human sperm. [Govt.MQP-2019]

- Ans. (i)** The head comprises of two parts namely acrosome and nucleus.
- (ii)** Acrosome is a small cap like pointed structure present at the tip of the nucleus and is formed mainly from the golgi body of the spermatid.
- (iii)** It contains hyaluronidase, a proteolytic enzyme, popularly known as sperm lysin which helps to penetrate the ovum during fertilization.
- (iv)** The nucleus is flat and oval.

2. What is known as capacitation of sperm cells? [HY-2019]

- Ans. (i)** Sperm capacitation is a biochemical event that enables the sperm to penetrate and fertilise the egg.
- (ii)** The sperms deposited in the female reproductive tract undergo capacitation.

4. What is ovulation?

[Mar-2020]

- Ans. (i)** The release of ovum by the rupture of the Graafian follicle is called **ovulation**.  
**(ii)** It occurs during ovulatory phase of menstrual cycle.

**SHORT ANSWERS**

**3 Marks**

1. Name the temporary endocrine organ formed during pregnancy. Write its uses.

[HY-2019]

- Ans. (i)** Placenta is a temporary endocrine organ formed during pregnancy  
**(ii)** It connects the foetus to the uterine wall through the umbilical cord.  
**(iii)** It is the organ by which the nutritive, respiratory and excretory functions are fulfilled.

**Zoology (Long version)**

**VERY SHORT ANSWERS**

**2 Marks**

2. Hypothalamus is the controlling centre of spermatogenesis. How?

[Sep. 2020]

- Ans.** Spermatogenesis starts at puberty due to increase of Gonadotropin Releasing Hormone (GnRH) by the **hypothalamus**.

GnRH acts on the anterior pituitary gland and stimulates secretion of two gonadotropins.

- (i)** Follicle Stimulating Hormone - Helps in testicular growth and spermiogenesis.  
**(ii)** Lutenizing Hormone - Stimulates the synthesis of Testosterone, which in turn stimulates spermatogenesis.
3. What is Ectopic pregnancy?
- Ans. (i)** If the fertilised ovum is implanted outside the uterus it results in ectopic pregnancy.  
**(ii)** The growth of the embryo may cause internal bleeding, infection and in some cases even death due to rupture of the fallopian tube.

