**ANIQUEST**

**REPRODUCTIVE PHYSIOLOGY**

1. **MALE REPRODUCTIVE SYSTEM**
2. **Terminologies:**

* **Embryonic kidney** – mesonephros
* **Mullerian inhibiting substance (MIS)** - A glycoprotein called Mullerian Inhibiting Substance (MIS) is in charge of suppressing the paramesonephric (Mullerian) ducts, which give rise to the uterus and vagin
* **Puberty**: Puberty is the period of time when a female reaches sexual maturity and is able to reproduce, as well as the time of her first oestrus or ovulation.
* **Gonadostat theory**: during the time of puberty the threshold level of oestradiol is lowered due to pituitary response.
* **Gubernaculum testis** - common name for the gonad's inguinal ligament.
* **Cryptorchid**: Animals with testicular conditions that prevent them from descended to the scrotum are referred to as cryptorchids (testiconds).
* **Sertoli cell** – or sustentacular cells which act as a "nurse" for spermatozoa during their development.
* **Blood-testis barrier** – created by a tight connection between neighbouring Sertoli cells, which keeps spermatozoa from entering the interstitium and allows control over the tubule's environment.
* **Epididymis** - collection and storage tubule for the testis
* **Ductus deferens (vas deferens)**- is the duct system from the epididymis' tail to the pelvic urethra.
* **Gubernaculum testis**-fibrous connection to the scrotum and un-descended testes are within the abdomen but outside the peritoneum during embryonic development
* **Semen:** The semi-gelatinous or liquid cellular suspension that contains the male gametes
* **• Acrosome:** The acrosome covers the anterior end of the sperm nucleus
* **Axoneme**: 9+2 arrangement of microtubules is responsible for sperm motility
* **Acrosomal hydrolytic enzymes**: acrosin, hyaluronidase, estrases, and acid hydrolases.
* **Spermatogenesis:** is defined as the process by which the spermatogonia undergo a series of cell divisions followed by a metamorphosis resulting in the production of highly differentiated and potentially motile cells called spermatozoa.
* Spermatogenesis takes place in two phases: spermatocytogenesis and spermiogenesis
* **Spermiogenesis:** The gradual morphologic changes that turn spherical, nonmotile spermatids into viable spermatozoa are known as spermiogenesis.
* **spermiation:** The process by which developed germ cells are released into the seminiferous tubule lumen is referred to as spermiation.
* **Spermatogenic cycle**: in a continuous single cross-sectional view of a seminiferous tubule a series of cell associations would be seen until the original cell association reappears. This cycle of developing cells is known as the spermatogenic cycle or cycle of seminiferous epithelium.
* **Spermatogenic wave:** The term "spermatogenic wave" refers to this successive shift in the cycle's stage along the tubule's length**.**
* **Capacitation:** the physical and chemical changes that occur after an spermatozoa is deposited in the female reproductive system, which enables it to penetrate the zona pellucida and fertilise the ova.

1. **Refresher points:**

* 16 primary spermatocytes could be produced from one A 3 spermatogonium.
* 64 spermatids can be potentially produced in one A 3 spermatogonium.
* In a bull, the process of spermatocytogenesis from spermatogonia to spermatid takes about 45 days.
* **The spermatogenic cycle** for;
* Pig – 8 days
* Sheep – 10 days
* Cattle – 14 days
* Human – 16 days
* The spermatogenesis is approximately 4 times the duration of the spermatogenic cycle.
* The seminiferous tubules are divided into two compartments by the Sertoli cells;

1. The basal compartment
2. The adluminal compartment

* The basal compartment accommodates germinal epithelial cells and is capable of communicating with the interstitial fluid.
* **Adluminal compartment**- formed by Sertoli cells that communicates centrally with the lumen of the tubule.
* The spermatozoa transport through the epididymis requires about – 7 days in the bull and 16 days in the ram.

**Daily sperm production (DSP) per gram of testis in different animals;**

* Boar - 24 – 31 million
* Stallion - 23.7 – 32.3 million
* Ram - 24 – 27 million
* Bull - 13 – 19 million

**Times taken for sperm to reach the oviduct;**

* Bitch - 20 min
* Mare - 15 min
* Ewe - 8 min
* Cow - 2-4 min

**Descent of testes into scrotum (Timing):**

* Humans and horses: immediately before or after birth;
* sheep and cattle: midgestation.

**Spermatozoa retain their fertilizing capacity in the female tract for;**

* Cow, Ewe and Sow- 24-48 hrs
* Bitch - 90 hrs
* Mare -5 days

**The fertile life of ovulated ova in different domestic animals**;

* Cow = 20 - 24 hours
* Sheep = 16 – 24 hours
* Swine = 8 – 10 hours
* Horse = 6 – 8 hours
* The temperature of the testicles is 4–7°C lower than the body's core temperature**.**

**Table: 1 Sperm reservoir sites in different animals;**

|  |  |  |
| --- | --- | --- |
| Sl. no. | Species | Sites |
| 1 | Cattle | Cervical crypts |
| 2 | Mare | Uterotubal junction |
| 3 | Sow | Uterotubal junction |
| 4 | Bitch | Endometrial glands. |

**Table 2: Age of puberty in females of domestic species;**

|  |  |  |  |
| --- | --- | --- | --- |
| Sl. No. | Species | female (in months) | male (in months) |
| 1 | Cattle | 6-10 | 9-10 |
| 2 | Sheep | 4-15 | 6-8 |
| 3 | Goat | 4-15 | 5-9 |
| 4 | Horse | 12-18 | 12-18 |
| 5 | Pig | 6-8 | 5-8 |
| 6 | Dog | 6-7 | 5-12 |
| 7 | Cat | 5-9 | 9-12 |

**Table 3: Homologies of male and female reproductive systems;**

|  |  |  |  |
| --- | --- | --- | --- |
| Sl. No. | Indifferent | Male | Female |
| 1 | Mesonephric duct | Epididymis | Gartner’s duct |
| 2 | Mullerian duct | Appendage of testis | Fimbria of oviduct, oviduct, uterus, vagina |
| 3 | Urogenital sinus | Bulbourethral glands, Prostate gland, Prostate galnd | Urethra, vestibule, vagina |
| 4 | Genital tubercle | Glans penis, Corpus penis | Clitoris |
| 5 | Urethral folds | Raphe of scrotum and  penis | Labia minora |
| 6 | Labioscrotal  swellings | Scrotum | Labia majora |

1. **Female reproduction**
2. **Terminologies;**

* **Primordial follicles-** also known as primary follicles, are made up of an oocyte encircled by a single layer of flattened granulosa cells with irregularly shaped nuclei.
* **Growing follicle**: Follicles that have started growing from the resting stage )primordial follicles) but do not have a theca layer or antrum (cavity).
* **Graafian follicle:** Those follicles that exhibit a noticeable antrum (cavity)
* **Fertilisation:** the process through which male and female gametes combine to create a single cell**.**
* **Follicular wave**: Three to six follicles are initiated to grow together under the influence of increasing levels of FSH which is described as a follicular wave.
* **Ovulation**: It is a mechanism by which the ovum is released from mature graffian follicle in response to LH surge
* **Estrous cycle**: In all domestic animals that have attained puberty there is a definite physiological functional rhythm of the reproductive system called the estrous cycle.
* **Estrus:** In most species, this is the time of sexual receptivity when ovulation and mating take place and the corpus luteum starts to develop**.**
* **Monoestrus** - animals have only one estrous cycle per year –dogs, wolves, bears
* **Polyestrus** - animals have several estrous cycles per year-cattle, pigs, humans; Cows and sows - non-seasonally polyestrus animals.
* **Seasonal breeders -** Animals that have one or more estrous cycles during specific times of the year are known as seasonal breeders**.**
* **Seasonally polyestrous animals** (exhibit many cycles of estrous during certain periods of the year known as breeding season) - ewes, does, and mares.
* **Follicular phase:** sometimes referred to as proliferative or oestrogenic phase, it comprises the proestrus and estrus phases and is characterised by egg maturation, ovulation, and dominating estradiol production from the follicle.
* **Luteal phase (secretory phase):** metestrus and diestrus are included; corpus luteum forms; fertilisation and embryo development occur; progesterone from the CL is dominant.
* **Whitten effect**: When a male mouse is introduced into a group of female mice, it causes synchronization of estrus in females of that group and this effect is called the Whitten effect.
* **Bruce effect**: If a pregnant female mouse is placed in a cage with a strange male mouse, pregnancy fails. This effect is known as the Bruce effect.
* **Lee Boot Effect**: Abrupt exposure of females to a male nearing the time of puberty advances the onset of puberty or breeding season. This is known as the Lee Boot Effect.
* **The Ram or Boar Effect:** Exposure of a female sheep or sow to a male of the same species will cause the early onset of puberty. This is due to pheromonal and other sensory signals that influence the release of GnRH in the hypothalamus**.**
* **Pseudopregnancy or false pregnancy**: can be defined as an exaggerated diestral response in bitch and rodents.
* **Morula:** At roughly 16 to 32 cells, the majority of species develop a morula**.**
* **Blastocyst:** Morula having a fluid-filled cavity (blastocoele) is referred to as blastocyst.
* **Maternal Recognition of Pregnancy**: At the appropriate time, the conceptus must produce some substances (protein/ steroid) to signal its presence to the mother called MRP.
* **Implantation:** This is the process by which a fresh embryo settles down to grow into a foetus at a developmental location of endometrium.
* **Zona hatching:** This is the process by which the embryo is released from the zona pellucida 6–11 days following fertilisation.

**Refresher points:**

* The monotocous animal (cow, ewe, and mare) has an ovoid-shaped ovary.
* Polytocous animal (sow, bitch, or cat) ovary appears as a cluster of grapes.
* The mare has a kidney-shaped ovary.
* **Non-seasonal polycyclic animals** – Cow & Sow
* **Seasonally polycyclic animals** - Mare, Ewe, Doe & Cat
* **Monocyclic animals** – Bitch
* Cow, Ewe and Mare: Bipartite uterus
* Sow: Bicornuate uterus
* Primates: Simplex uterus
* In domestic animals (except bicth and Queen), oogonia develops into a primary oocyte shortly before or after birth.
* In all domestic species, ovulation takes place during the oestrus phase of the cycle, with the exception of cows, where it happens approximately 12 hours following the conclusion of estrus.
* **Site of fertilization**: ampullary–isthmic junction of the oviduct .
* **Short-day breeders** – Breeders that use shorter days: sheep, goats, and deer go through their estrous cycle in the winter, and they go through anestrus in the spring and summer.
* **Long-day breeders** – Estrous cycle occur in the spring or early summer, and enter anestrus in the winter
* **Seasonally monoestrus** (exhibit a single estrus followed by anestrus) – bitches.
* Estradiol 17 β – predominates in nonpregnant animals.
* Estrone is predominat estrogenic hormone in pregnant farm animals whereas Estriol – predominates in pregnant primates.
* Zona hatching after fertilization in different animals – cattle 9-11 days, horse-8; sheep-7-8 and swine in 6 days after fertilization.
* Young animals have slightly shorter gestation lengths than older ones.
* Monotoccus animals have longer gestation lengths than polytoccus animals.
* A male fetus will be carried a few days (1-2 days) longer than a female fetus.
* Larger size species having longer gestation length.

**Types of placentation;**

* **Epitheliochorial placentation:** Eg: Sow, Mare, Cow, and donkey.

It is the simplest form of placentation consists of all six layers. Epithelium of the uterus has close contact with the chorion of the fetal placenta

* **Syndesmochorial:** Eg: Ewe and doe.

one (epithelial lining of the uterus) of six layers is absent - the epithelial lining of the uterus. the chorion forms direct contact with the connective tissue and the endothelium of the dam.

* **Endotheliochorial**: Eg. Bitch and Queen

Two layers (connective tissue and the epithelium of the uterus) out of six are absent. And the endothelial layer of blood vessels of the dam directly attaches with the fetal structure.

* **Hemochorial**: Eg: Monkey, Women.

All the layers of the maternal tissues are absent in formation of placenta, and only fetal structures are left; the chorion of foetus, is bathed by the blood of the dam

* **Hemoendothelial:** Eg: Guinea pig, rabbit, and rat

All the layers of the maternal tissues are absent and only one fetal layer (endothelial layer of the fetal capillaries) separates the maternal and fetal blood systems.

* **Diffuse**: Chorionic villi cover most of the fetal placenta, project into the crypts, scattered over the entire endometrium of the uterus except at the openings of the uterine glands. Eg: Sow, mare.
* **Discoid or Spherical**: The placenta gets attached to the uterus in a disk-shaped area only Eg: Guinea pigs, Rabbits, and rats.
* **Zonary**: The chorion of the fetal placenta is attached in a grill-like band with the uterus of the dam. Eg: Bitch and Queen.
* **Cotyledonary**: Here the attachment of the portion of the chorion of the fetus (Cotyledons) with the uterine epithelium of the dam in a mushroom-like area is called the caruncles. Eg: Ewe, Doe, Cow, and Buffalo.

**PH of the female reproductive tract;**

* Vaginal PH is acidic - 4.0
* Cervical mucus is basic - 8.4
* Uterus - intermediate 7.8
* Oviductal fluid – 7.1 to 7.3 in the follicular phase

- 7.5 to 7.8 in the luteal phase

**Transport time of ova in the oviduct;**

* Cattle - 90 hrs
* Sheep – 72 hrs
* Horse - 98 hrs
* Pig - 50 hrs
* Cat - 148 hrs
* Dog - 168 hrs
* Women - 48 to 72 hrs

**Regression of corpus luteum starts (days from ovulation);**

* Cow – 14 – 15
* Ewe – 12 – 14
* Sow – 13
* Mare - 17

**Table: Estrus period and ovulation time in different animals;**

|  |  |  |  |
| --- | --- | --- | --- |
| **Species** | **Duration of the estrous cycle (in days)** | **Duration of estrus** | **Time of Ovulation** |
| Ewe | 16-17 | 24 hrs | After the onset of estrus |
| Doe | 20-21 | 24 – 36 hrs | After the onset of estrus |
| Pig | 19-21 | 38 – 42 hrs | After the onset of estrus |
| Mare | 19-25 (21) | 4-8days | Before the end of the estrus |
| Cat | In estrus at 7-8 m intervals | 24 – 36 hrs | Post copulation |
| Cow | 21-22 | 12 – 14 hrs | After the end of estrus |
| Bitch | In estrus at 7-8 m intervals | 7-9 days | Post copulation |

**Table: Signs of estrus in different species;**

|  |  |
| --- | --- |
| **Species** | **SIGNS OF ESTRUS** |
| Cow | Bellowing, mounting behaviour, Swollen vulva, discharge of Cervical mucus, Frequent urination, decreased milk yield, and decreased feed intake. |
| Mare | Frequent urination, Exposure of clitoris (winking of clitoris). |
| Doe | Edema and hyperemia of the vulva, Frequent and rapid tail wagging. |
| Sow | Watery vulval discharge, standing quietly while pressing loin (lordosis) |
| Bitch | During proestrus, bleeding from the vulva and vulva swelling; during estrus-  diminishing of vulval swelling, Less turgid vagina. |
| Queen | Characteristic call and Rollover on its back. |

**Table: Maternal Recognition of Pregnancy;**

|  |  |  |
| --- | --- | --- |
| **Species** | **MRP days** | **MRP Signal** |
| Cow | 16 -19 days of pregnancy | Bovine trophoblast protein bTP-1 |
| Sheep | 16-19 days of pregnancy | OTP -1 or Type I conceptus interferon |
| Pigs | 11-12 days of pregnancy | Estrogen |

**Table: Gestation length and days of implantation in different animals;**

|  |  |  |
| --- | --- | --- |
| **Species** | **Days of implantation** | **Gestation length** |
| Cow | 30 – 35 days | 280 days |
| Ewe | 15 – 18 days | 150 days |
| Doe | 20 - 25 days | 150 days |
| Bitch | 15 days | 60 – 63 days |
| Sow | 14 - 20 days | 114 days |
| Queen | 13 days | 56 - 65 days |

**Table: reproductive hormone and their functions;**

|  |  |  |
| --- | --- | --- |
| **Sl. No.** | **Hormones** | **functions** |
| 1 | Melatonin | * Control the reproduction in seasonal breeding species * Influencing the release of Prolactin, FSH, LH, * Onset of puberty |
| 2 | Serotonin | * Inhibits the basal secretion of LH and regulates other neurosecretory systems |
| 3 | Noradrenaline (Norepinephrine) | * Blocks the oestradiol–induced release of LH, which is responsible for ovulation. * Inhibition of the conversion of dopamine to noradrenaline, * Stimulate the release of FSH & LH |
| 4 | Dopamine | * Control of prolactin release |
| 56 | LH | * Stimulate Leydig cells * Stimulate testosterone production * Responsible for ovulation and formation of CL |
| 7 | FSH | * Stimulates Sertoli cells * Stimulates secretion of estrogen and inhibin |
| 8 | Testosterone | * Maintains spermatogenesis - Supports meiosis * Develops and maintains secondary male sexual characteristics * Anabolic hormone |
| 9 | C-16 unsaturated androgens - 5α-androstenone | * Primarily in the boar acts as a pheromone in saliva and urine * Responsible for boar taint |
| 10 | Inhibin & oestradiol | * Act in concert in suppressing FSH secretion |
| 11 | Oocyte maturation inhibitor | * Maintains oocyte at dictyate stage of meiosis. |
| 12 | Estradiol | * Estradiol limits the growth of long bones by starting the closure of the epiphyseal growth plate. * It also stimulates the growth of the mammary gland's duct system. * Estradiol is the cause of the female's secondary sex characteristic. |
| 13 | Relaxin | * Dilation of pelvic structure, cervix, and vagina before parturition |
| 14 | Activin | * Present in the follicular fluid and rete testis fluid and have a stimulatory effect on FSH release |
| 15 | Progesterone | * Important for maintenance of pregnancy and implantation by increasing the activity of the secretory glands in the endometrium and by inhibiting the motility of the myometrium. * Acts synergistically with estrogen to induce behavioral signs of estrus. * Responsible for lobular and alveolar growth in the mammary gland. |

**QUESTIONS**

1. Accessory sex gland discharges their content into;
2. Ductus deference only
3. Pelvic portion of urethra only
4. **Ductus deference or Pelvic portion of the urethra**
5. none
6. Scrotal hernia is particularly common in;
7. **Boar**
8. Stallion
9. Bull
10. Buck
11. Which of the following is true for cryptorchid males;
12. **They are sterile but show normal sexual desire**
13. They are fertile but don’t normally show sexual desire
14. They are fertile and show normal sexual desire
15. They are sterile and also don’t normally show sexual desire
16. Glyceryl phosphorylcholine is a distinctive component of;
17. Vesicular gland
18. **Epididymal secretion**
19. Prostate secretion
20. None of the above
21. Which of the following statements is true;
22. Spermatic fluid travels via the deferens to the pelvic urethra during ejaculation, where it combines with secretions from accessory sex glands.
23. Emission is passage of semen along the penile urethra
24. **Emission brought about by smooth muscle under autonomic control**
25. Ejaculation brought about by para-sympathetic nerve action on smooth muscle
26. The type of CL present during pregnancy is;
27. **Corpus luteum verum**
28. Corpus luteum spurium
29. Corpus albicans
30. All of the above
31. Maternal recognition of pregnancy in cattle occurs between days;
32. 20-25 days of gestation
33. 10-15 days of gestation
34. **15-17 days of gestation**
35. 25-30 days of gestation
36. In which of the following species ovulation fossa is evident;

a) Cattle

b) Buffaloes

c) Dog

d) **Horse**

1. The species in which placentas do not secrete progesterone and it is imperative that the CL maintain its secretory activity during pregnancy.;

a) Cattle

b) Buffaloes

c) Dog

d) **Horse**

1. In swine, the uterus is of the;
2. **Bicornuate type (uterus bicornis)**
3. Bipartite type
4. Both Bicornuate and Bipartite
5. None
6. Which of the following is not a function of the uterus;
7. transport of male gamete from the site of ejaculation to the site of fertilization
8. fictional Regulation CL
9. Initiation of pregnancy, implantation, and parturition
10. **preventing the transport of nonviable and defective sperm.**
11. Which hormone is responsible for the Stimulates contraction of pregnancy and also causes milk ejection;
12. Prolactin (PRL)
13. **Oxytocin**
14. Luteinizing hormone (LH)
15. Both a and b
16. Which of the following is not a function of Progesterone;
17. Responsible for behavioural expression of oestrus
18. Responsible for Development of alveoli of the mammary glands
19. **Responsible female secondary sexual characteristics**
20. at high levels it Inhibits oestrus
21. In normal breeding conditions age of puberty for sheep, goats & cattle respectively is;
22. **6 to 7 months &12 months**
23. 10-12 months & 24 months
24. 6 to 7 months & 24 months
25. 12 months &12 months
26. Which species has the shortest length of estrous cycle in days;
27. **Ewe**
28. Goat
29. Cow
30. Horse
31. Which species has the longest duration of estrous in days;
32. Ewe
33. Goat
34. Cow
35. **Horse**
36. Dairy cattle reach puberty when the body weight is about;
37. 25% to 30% of the adult weight
38. **30% to 40% of the adult weight**
39. 45% to 55% of the adult weight
40. > than 55% of the adult weight
41. The nuclear and cytoplasmic alterations that spermatids go through throughout the maturation period are referred to as;
42. Spermatidosis
43. Spermiation
44. Spermatogenesis
45. **Spermiogenesis**
46. Fertilizing ability of spermatozoa can be achieved by;
47. Changes in the nature of surface plasma membrane
48. Changes in the nuclear chromatin
49. Unidirectional progressive motility
50. **All of the above**
51. the artery which supply blood to the penis;
52. **Terminal branch of the internal pudendal arteries**
53. Terminal branch of the external pudendal arteries
54. Abdominal artery
55. None of the above
56. The no. of sperms intended for artificial insemination in cattle and sheep;
57. 125 and 10 million respectively
58. **10 and 125 million respectively**
59. 100 and 125 million respectively
60. 80 and 200 million respectively
61. Prostaglandins aid in fertilization by;
62. It reacts with cervical mucus and make it more receptive to sperm
63. Prostaglandins cause smooth muscle contraction
64. **Both a and b**
65. None of the above
66. Cryptorchid testes are;
67. Testis is in inguinal canal but not in the scrotum
68. **More prevalent in horse and pig**
69. Both a and b
70. None of the above
71. Beef cattle reach puberty when the body weight is about;
72. 25% to 30% of the adult weight
73. 30% to 40% of the adult weight
74. **45% to 55% of the adult weight**
75. > than 55% of the adult weight
76. Which of the following statement false for breeding season in animals;
77. wild animals have well defined breeding season when both male and female are active
78. Cattle and swine are seasonal breeders
79. sheep, goats are seasonal breeders
80. horse are not a seasonal breeders
81. Domestic animals with long day and shortday breeding are;
82. Mare & Sow respectively
83. **Mare & Ewe respectively**
84. Ewe & Mare respectively
85. Sow &Mare respectively
86. Freezing point depression of bull semen is;

a) 1ºC

b) -0.75 ºC

c) -0.65 ºC

d) **-0.55 ºC**

1. High content of ergotheonine and inositol in vesicular gland is characteristic of which species;
2. Bull
3. **Boar**
4. Buck
5. stallion
6. Urethral gland is found in;
7. Horse
8. Cattle
9. **Humans**
10. Sheep
11. The primordial follicle reserve in females are formed during;
12. **Fetal life or soon after birth**
13. Adult life or soon after puberty
14. Fetal life or soon after fertilisation
15. Adult life or before the puberty
16. Production of androgens in response to increasing basal LH is a function of;
17. Granulosa cells
18. Primordial follicle
19. Follicular wall
20. **Thecal cells**
21. . The main hormones linked to parturition, pregnancy, and ovarian cyclisity are;
22. Gonadotropins
23. Estrogens
24. Progesterone
25. **All of the above**
26. FSH and LH levels are controlled by;
27. Negative feedback from the gonads
28. Positive feedback from the gonads
29. Tonic levels are increased by estrogen
30. Tonic levels are decreased by progesterone
31. Tonic levels are independent of estrogen and progesterone
32. i, ii. iii, iv statements are correct
33. **i, iii, iv statements are correct**
34. ii, iii, iv statements are correct
35. All statements are correct
36. Progesterone a major reproductive hormone produced by;
37. Adrenal cortex
38. Corpus luteum of Ovary
39. Placenta
40. **All of the above**
41. Which of the following statement is false for follicular fluid;
42. The peripheral plasma serves as the primary source of follicular fluid.
43. follicular fluid Contains steroids and glycoproteins
44. Large antral follicles contain remarkably high levels of estradiol.
45. **Small follicles contain remarkably high levels of androstenedione**
46. The regulatory factor presents in follicular fluid which inhibits completion of oocyte meiosis is;
47. Luteinization inhibitor
48. **Oocyte maturation inhibitor (OMI)**
49. FSH receptor binding inhibitor
50. Inhibin
51. Which of the following statement is false for number of follicles that develop during follicular growth;
52. Follicular development in cattle is rapid as compare to other animals.
53. horse releasese only one egg at each estrous cycle.
54. In swine, 10-25 follicles ripen at each estrous cycle.
55. **In buffaloes, one to three follicles may reach maturity.**
56. Which of the following is a site of ovulation in ovary;
57. **Any point on ovary surface except hilus.**
58. Any point on ovary surface except ovulation fossa.
59. Any point on ovary surface.
60. None of the above.
61. First A.I in domestic animals was conducted by;
62. G. Amantea
63. Leeuwenhoek
64. **L.Spallanzani**
65. Rapiquet
66. In most of mammals, the pH of semen is generally;
67. **Alkaline**
68. Acidic
69. Neutral
70. None of the above
71. Urethral process is found in penis of;

a) Bull

b) Tom cat

c) **Ram**

d) Boar

1. Percentage of spermatozoa in semen is;

a) **20%**

b) 15%

c) 10%

d) 5%

1. Choose the correct statement about semen ejaculated deposited in the female reproductive tract during copulation;
2. In boar the lesser volume of semen is ejaculated and deposited
3. In horse semen is ejaculated in vagina and cervix.
4. In cattle voluminous semen is ejaculated.
5. **In pig semen id ejaculated into the uterus.**
6. Choose the incorrect statement;
7. Fertilised Egg acquires plasma membranes from male gamate.
8. As oocyte matures, the amount of its cytoplasm increases.
9. Ova Survival in female reproductive tract is 12-24 hours after ovulation.
10. **Male gametes present in vas deferens and epididymis are unfit for artificial insemination.**
11. Sperm fertilizability is maintained in female reproductive tract up to;
12. 6-12 hr after ejaculation.
13. 12-24 hr after ejaculation.
14. **24 hr after ejaculation.**
15. 48 hr after ejaculation.
16. Retention of penis during copulation is observed in;

a) Dog only

b) Pig only

c) Dog and Horse

d) **Dog and Pig**

1. Which of the following is not a function described the cervix and its secretion;
2. It acts as a sperm reservoir.
3. It contain fructose which is meets energy requirements of sperm.
4. It helps in filtering immobile and defective sperm.
5. **It is receptive to sperm penetration at all phases of the cycle.**
6. Transuterine migration of egg is a common phenomenon in;
7. Ruminants
8. Canines
9. Felines
10. **Ungulates**
11. Percentage of spermatozoa in semen is;
12. **20%**
13. 15%
14. 5%
15. 10%
16. The ions necessary for optimum sperm motility is;
17. Na+
18. Mg+
19. **K+**
20. Cu+
21. Most important spermicidal heavy metal is;
22. K+
23. Mg+
24. **Cu+**
25. Na+
26. Number of caruncles in cattle;

a) 40-80

b) **70-120**

c) 12-160

d) >200

1. The female that conceived for first time is called as;

a) **Primipara**

b) Nullipara

c) Pluripara

d) Unipara

1. Epitheliochorial diffuse type of placenta is found in;
2. Pig
3. **Horse**
4. Goat
5. Cattle
6. Corpus luteum is absent in;
7. Mare
8. Ewe
9. **Hen**
10. Bitch
11. Arrangement of microtubules is in the form;
12. 2+9
13. **9+2**
14. 4+8
15. 8+4
16. Spermiogenesis does not include;
17. Nuclear maturation / Condensation of chromatin,
18. Formation of the sperm tail
19. Formation and development of the acrosomal cap
20. **Cellular divisions and developmental changes**
21. Duration of Spermatogenic cycle in bull is;
22. 9 days
23. 10 days
24. 12days
25. **14 days**
26. Kidney shaped ovary present in;
27. Cow
28. Sow
29. **Mare**
30. Ewe
31. The fertilizing ability of spermatozoa is achieved;
32. After completion of Spermatogenesis
33. During transit through seminiferous tubule
34. **During transit through epididymis**
35. During transit through vas deferens
36. When a male mouse is introduced into a group of female mice, it causes synchronization of estrus in females of that group and this effect is called as;
37. **Whitten Effect**
38. Bruce Effect
39. Ram Effect
40. Lee boot Effect
41. The follicular periods (proestrus and estrus) are characterized by;
42. **Estrogen dominance**
43. Progesterone dominance
44. Gonadotropin dominance
45. All of the above
46. In pregnant mare endometrial cups begin to secrete PMSG at about;
47. **35 days of pregnancy**
48. 25 days of pregnancy
49. 28 days of pregnancy
50. 45 days of pregnancy
51. Counter current mechanism of the ovarian artery with the uterine vein serves to:
52. **Transport PGF2α from the uterus to the ovary**
53. Cool the ovary
54. Enhance the chance of fertilization
55. Transport spermatozoa from the uterus to the ovary
56. Estrogen secretion from fetoplacental unit during prepartum period is responsible for;
57. Increase in PGF2α secretion
58. Increase in relaxin hormone secretion
59. Increase in Myometrial protein synthesis
60. **All of the above**
61. PGF2α increases the sensitivity of the uterus to which hormone;
62. **Oxytocin**
63. Progesterone
64. Estrogen
65. Relaxin
66. Strong uterine and abdominal contraction takes place in which stage of labour;
67. Stage I
68. **Stage II**
69. Stage III
70. None of the above
71. In which species the stage II and III of labour are not separate;
72. Sow
73. Ewe
74. Doe
75. **All of the above**
76. FSH stimulates production of which of the following hormones by sertoli cells;
77. Androgen
78. E2 & androgen
79. ABP& Androgen
80. **ABP& Inhibin**
81. Acquiring fertilizing ability by spermatozoa does not involve;
82. Acquiring progressive motility.
83. Changes in nuclear chromatin.
84. Changes in nature of the surface of the plasma membrane.
85. **Droplet movement and loss.**
86. Examples of reflex ovulators;
87. Cat
88. Mink
89. Ferret
90. **All of the above**
91. Incidence of Polyspermy in most of the domestic animal’s accounts for;
92. **1-2%**
93. 2-5%
94. 5-10%
95. >10%
96. Average gestation period of sheep and swine is;
97. 114 and 148 respectively.
98. **148 and 114 respectively.**
99. 279 and 114 respectively.
100. 178 and 158 respectively.
101. Epididymis is the principal storage organ;
102. Corpus
103. **Cauda**
104. Caput
105. All of the above
106. Gestation period for twin calves is;
107. 3-6 days more
108. **3-6 days less**
109. Same
110. 6-9 days more
111. Which of the following is true for Freemartin animals;
112. Freemartin heifer is an intersexual individual.
113. Freemartins are more common in cattle.
114. It is a genetic female that was born as a co-twin with a male.
115. Only A
116. ONLY B&C
117. ONLY A&B
118. **A, B &C**
119. Consider two statements and choose the correct word to explain them;
120. genetic female was born as a co-twin with a male, leading to the modification of female genitalia in the male direction

B- presence of both male and female gonads in one individual

1. A - Hermaphrodite and B - Freemartin
2. **A - Freemartin and B - Hermaphrodite**
3. A - Freemartin and B - Freemartin
4. A - Hermaphrodite and B - Hermaphrodite
5. Which of the following is not a function of the cervix;
6. Transport of sperm
7. Sperm reservoir
8. Sperm selection center
9. Capacitation of sperm
10. Absorption of seminal plasma
11. A&B
12. B&E
13. C&E
14. **D&E**
15. Choose the correct examples of animals explained in the below statements;
16. Animals in which copulation initiates neuroendocrine reflex that results in ovulation
17. Animals in which ovulation occurs spontaneously after normal follicle growth during the estrus cycle.
18. A - goat and B - Cattle
19. **A - cat and B - dog**
20. A - cat and B - rabbit
21. A - cattle and B - Cat
22. Choose correct examples of animals explained in the below statements;
23. Animals have only one estrous cycle per year
24. The estrous cycle occurs when days get longer
25. A - goat and B - Cattle
26. **A - dog and B - horse**
27. A - horse and B - dog
28. A - dog and B - Cat
29. What happens if;
30. male mouse is introduced into a group of female mice cage
31. A pregnant female mouse is placed in a cage with a strange male mouse
32. A - female mice will get pregnant, B - female mice pregnancy fails
33. A – female mice pregnancy fails, B - females parturiates
34. **A - female mice estrus will synchronization, B - female mice pregnancy fails**
35. None of the above
36. Choose the correct answer from the following statements;
37. Bitch is in proestrus
38. There is vaginal secretion of Methyl-p-hydroxybenzoate
39. Bitch secrete 5α androstenone
40. **Statement B is true and A is the reason for B**
41. Statements A&B are true and A is the reason for B
42. Statement B is true and A is not the reason for B
43. Statements A&B are true and A is not the reason for B
44. Choose the correct answer from the following statements;

A- Pseudopregnancy in bitch

B- Corpora lutea of nonpregnant bitch remain functional for an extended period

C- Exaggerated diestral response in bitch

1. **A is the reason for B&C**
2. A is the reason for only B but not for C
3. A is the reason for only C but not for B
4. A is the reason for neither B nor C
5. Match the following and choose the correct answer;
6. Estus observed in mare 8 to 12 days postpartum
7. Infertile estrus
8. Estus in Pig 1 to 2 days postpartum
9. Non-ovulatory estrus
10. A - B and C - B
11. A - D and C - B
12. **A - B and C - D**
13. A - D and C - D
14. Which of the following statements are false;
15. Puberty in males occurs earlier in the tropics than in the temperate zones.
16. Puberty in Jersey heifers earlier than Holsteins.
17. In general, smaller breeds experience puberty at an earlier age.
18. All of the above statements
19. Only B
20. Only A
21. **None of the above**
22. Assertion: PMSG is used to induce superovulation in domestic animals.

Reasoning: PMSG is ineffective in the mare and will not induce superovulation.

1. Reasoning is a valid justification for the assertion and both the assertion and the reasoning are true
2. assertion and the rationale are both true but the reasoning does not adequately explain the assertion
3. Reasoning is wrong, the assertion is correct.
4. Assertion is correct but Reasoning is wrong
5. Assertion: Inhibin is also termed as folliculostatin.

Reasoning: Inhibin can inhibit the release of FSH without altering LH release.

1. **Reasoning is a valid justification for the assertion and both the assertion and the reasoning are true**
2. assertion and the rationale are both true but the reasoning does not adequately explain the assertion
3. Reasoning is wrong, the assertion is correct.
4. Assertion is correct but Reasoning is wrong
5. Assertion: Secretary protein (OTP -1 or Type I conceptus interferon) is essential for successful pregnancy in sheep.

Reasoning: Secretary proteins inhibit Progesterone production.

1. Reasoning is a valid justification for the assertion and both the assertion and the reasoning are true
2. assertion and the rationale are both true but the reasoning does not adequately explain the assertion
3. **Reasoning is wrong, the assertion is correct.**
4. Assertion is correct but Reasoning is wrong
5. Assertion: Primates have an Invasive type of implantation.

Reasoning: Blastocyst of Primates penetrate the uterine epithelium during implantation.

1. **Reasoning is a valid justification for the assertion and both the assertion and the reasoning are true**
2. assertion and the rationale are both true but the reasoning does not adequately explain the assertion
3. Reasoning is wrong, the assertion is correct.
4. Assertion is correct but Reasoning is wrong
5. Assertion: The gestation lengths of Mule and Hinny are the same.

Reasoning: The parents of Mule and Hinny are the same i.e. horse and donkey.

1. Reasoning is a valid justification for the assertion and both the assertion and the reasoning are true
2. assertion and the rationale are both true but the reasoning does not adequately explain the assertion
3. Reasoning is wrong, the assertion is correct.
4. **Assertion is correct but Reasoning is wrong**
5. Assertion: The cow has an Epitheliochorial type of placenta.

Reasoning: The placentation of a cow consists of all six layers.

1. **Reasoning is a valid justification for the assertion and both the assertion and the reasoning are true**
2. assertion and the rationale are both true but the reasoning does not adequately explain the assertion
3. Reasoning is wrong, the assertion is correct.
4. Assertion is correct but Reasoning is wrong
5. Assertion: Primates have a chorionic type of placentation.

Reasoning: In primates the chorion (trophoblast), is bathed by the blood of the dam.

1. Reasoning is a valid justification for the assertion and both the assertion and the reasoning are true
2. assertion and the rationale are both true but the reasoning does not adequately explain the assertion
3. Reasoning is wrong, the assertion is correct.
4. **Assertion is correct but Reasoning is wrong**
5. Assertion: In Nondeciduate type of placentation, there is no loss of maternal tissue at the time of parturition.

Reasoning: In Nondeciduate type placenta, fetal membranes are expelled at the time of parturition.

1. Reasoning is a valid justification for the assertion and both the assertion and the reasoning are true
2. **assertion and the rationale are both true but the reasoning does not adequately explain the assertion**
3. Reasoning is wrong, the assertion is correct.
4. Assertion is correct but Reasoning is wrong
5. Assertion: Introducing a pregnant mare to induce sexual maturity in immature rats.

Reasoning: A pregnant mare produces ECG hormone.

1. **Reasoning is a valid justification for the assertion and both the assertion and the reasoning are true**
2. assertion and the rationale are both true but the reasoning does not adequately explain the assertion
3. Reasoning is wrong, the assertion is correct.
4. Assertion is correct but Reasoning is wrong
5. Assertion: Progesterone is called as pregnancy hormone.

Reasoning: Increased progesterone level always indicates that animal is pregnant.

1. Reasoning is a valid justification for the assertion and both the assertion and the reasoning are true
2. assertion and the rationale are both true but the reasoning does not adequately explain the assertion
3. **Reasoning is wrong, the assertion is correct.**
4. Assertion is correct but Reasoning is wrong
5. The species in which the ovum is in first meiotic division at the time of ovulation;
6. **Horse, Dog, and Fox**
7. Cattle and Sheep
8. Dog and Cat
9. In all domestic animals
10. Primordial germ cells migrate to the gonadal ridge at about …………… days in bull fetus. (26)
11. Transport of spermatozoa through the epididymis takes about…………. days. (9-13 days)
12. Developmental fate of genital tubercle in male and female mammalian fetus is ……………………and …………………………. Respectively. (penis and clitoris)
13. In female animals ………………………………duct fuse forms uterus, cervix, and vagina. (Mullerian ducts)
14. In cattle and sheep, the ovary is…………... shaped, whereas in the horse it is ……….........Shaped (almond, bean)
15. The interstitial cells present in male animals are also called as …………… cells. (Leydig cells)
16. The Leydig cells secrete …………….and theca interna cells produce ……………….. (testosterone, estrogen)
17. Maximal fertility in the cow occurs ………………after calving. (60 to 90 days)
18. Gartner’s duct is remnant of ……………………. (wolffian duct)
19. ……………………… (right/left) ovary is more physiologically active in domestic animals. (Right)
20. One primary spermatocyte produces …………… spermatids. (4)
21. One spermatogonia produces ……………spermatids. (64)
22. Dual functions of ovary are…………………and …………………. (Gametogenesis and Steroidogenesis)
23. The growth of the follicle is gonadotropin dependent up to the stage of ………………. . (antrum formation)
24. Production of ……………. hormone by the follicles will determines which follicle will gain the LH receptors necessary for ovulation and luteinization. (Estradiol)
25. ………………. is predominant immunoglobulin in follicular fluid. (IgG)
26. The phase of estrous cycle in which Active corpora lutea are present in is called ……………… phase. (Luteal)
27. The period from antral follicle formation to ovulation is called as ……….. phase of the estrous cycle. (follicular phase)
28. From oogenesis onward, the diplotene nucleus of the oocyte remains in the resting stage called the ……………… nucleus. (Dictyate)
29. Polyspermy is a common phenomenon in …………….and …………... (Birds and Reptiles)
30. The Corpus luteum persists throughout pregnancy in all domestic animals except……………. (Mare)
31. ………………………….. is the major metabolic fuel for foetus. (Glucose)
32. ……………………. is most commonly used cryoprotectant for freezing of semen. (Glycerol)
33. …………… is a unique species in which epididymis can produce testosterone. (Horse)
34. The normal pH vagina is around ……… and cervical mucus is around ………. (4.0, 8.4)
35. Cervix is poorly defined in ………… species. (Dog)
36. In…………species ovulation occurs in metestrous. (Cattle)
37. First A.I in India was done by …….. in Mysore palace dairy farm. (Sampat Kumaram)
38. Osmotic pressure of semen ranges from…………. (280-300 mOsmol)
39. Uterine involution completed by …………days in cattle. (26-52 days)
40. Postpartum uterine discharge is called as ………. (Lochia)
41. ……………….is called as true water bag of foetus. (Amnion)
42. The release of male gametes into the lumen of the seminiferous tubules is known as………….. (Spermiation)
43. The entire process of Spermatocytogenesis takes approximately ………. days in bull. (45 days)
44. The release of formed germ cells into the lumen of the seminiferous tubule is known as……………… (Spermiation)
45. Series of changes in a given area of seminiferous epithelium between two appearances of the cellular association or developmental stages is called as ………………… (Spermatogenic cycle)
46. Sequential change in stage of cycle along the length of the seminiferous tubule is known as………………… (Spermatogenic Wave)
47. The tail of the epididymis contains ………. % of the total number of spermatozoa in the excurrent ducts, whereas the vas deference contains only …….. %. (70%, 2%)
48. Development of egg without fertilization is called as ………… (Parthenogenesis)
49. Twining in monotocous domestic animals is most frequently of ……….. type. (Dizygotic)
50. At least 2 conceptus per uterine horn must be present for pregnancy to be established in ………………species. (Swine)
51. Fusion and vesiculation of acrosome release …………… and …………. enzymes. (Hyaluronidase and Acrosin)
52. Acrosome reaction involve massive influx of …………….. ions. (Ca2+)
53. Endotheliochorial type of placenta present in ……….. species. (Dog)
54. Match the following;

|  |  |
| --- | --- |
| **A** | **B** |
| 1. LH | 1. Responsible for the growth of the duct system of the mammary gland |
| 1. Testosterone | 1. Responsible for lobular and alveolar growth in the mammary gland |
| 1. Progesterone | 1. Stimulate testosterone production |
| 1. FSH | 1. Anabolic hormone |
| 1. Estradiol | 1. Stimulates secretion of estrogen and inhibin |

1. a-i, b-ii, c-iii, d-iv, e-v
2. **a-iii, b-iv, c-ii, d-v, e-i**
3. a-ii, b-iii, c-iv, d-v, e-i
4. a-iii, b-iv, c-v, d-ii, e-i
5. Match the following;

|  |  |
| --- | --- |
| **A** | **B** |
| 1. Inhibin | 1. Influencing the release of FSH, LH, Prolactin |
| 1. Melatonin | 1. Control prolactin release |
| 1. Dopamine | 1. Dilation of pelvic structure, cervix, and vagina before parturition |
| 1. 5-α-Androstenone | 1. Inhibits FSH secretion |
| 1. Relaxin | 1. Responsible for boar taint |

1. a-i, b-ii, c-iii, d-iv, e-v
2. a-iii, b-iv, c-v, d-I, e-ii
3. **a-iv, b-i, c-ii, d-v, e-iii**
4. a-ii, b-iii, c-iv, d-v, e-i
5. Match the following; (pH of secretions of female reproductive organ):

|  |  |
| --- | --- |
| **A** | **B** |
| a. Vaginal fluid | i. 7.8 |
| b. Cervical mucus | ii. 4.0 |
| c. Oviductal fluid in the follicular phase | iii. 8.4 |
| d. Uterus | iv. 7.5 to 7.8 |
| 1. Oviductal fluid in the luteal phase | v.7.1 to 7.3 |

1. a-i, b-ii, c-iii, d-iv, e-v
2. a-iii, b-iv, c-v, d-I, e-ii
3. a-iv, b-i, c-ii, d-v, e-iii
4. **a-ii, b-iii, c-v, d-i, e-iv**
5. Match the following; (Daily Sperm Production per gram of testis):

|  |  |
| --- | --- |
| **A** | **B** |
| 1. Bull | i. 24 – 27 million |
| 1. Ram | ii. 23.7– 32.3 million |
| 1. Boar | iii. 24 – 31 million |
| 1. Stallion | iv. 13 – 19 million |

1. a-i, b-ii, c-iii, d-iv
2. a-iii, b-iv, c-ii, d-i
3. **a-iv, b-i, c-ii, d-iii**
4. a-ii, b-iii, c-iv, d-i
5. Match the following; (Transport time of ova in oviduct in different species):

|  |  |
| --- | --- |
| **A** | **B** |
| 1. Cattle | 1. 50 hrs |
| 1. Sheep | 1. 148 hrs |
| 1. Horse | 1. 90 hrs |
| 1. Pig | 1. 72 hrs |
| 1. Cat | 1. 98 hrs |
| 1. Dog | 1. 168 hrs |

1. a-i, b-ii, c-iii, d-iv, e-v, f-vi
2. **a-iii, b-iv, c-v, d-i, e-ii, f-vi**
3. a-iv, b-i, c-ii, d-vi, e-iii. f-v
4. a-vi, b-iii, c-iv, d-v, e-i, f-ii
5. Match of the following; (Sperm reservoir site in different species):

|  |  |
| --- | --- |
| **A** | **B** |
| 1. Cattle | 1. Utero-tubal junction |
| 1. Mare | 1. Utero-tubal junction |
| 1. Sow | 1. Endometrial glands. |
| 1. Bitch | 1. Cervical crypts |

1. a-i, b-ii, c-iii, d-iv
2. a-iii, b-iv, c-ii, d-i
3. **a-iv, b-i, c-ii, d-iii**
4. a-ii, b-iii, c-iv, d-i
5. Match the following; (Spermatogenic cycle):

|  |  |
| --- | --- |
| **A** | **B** |
| 1. Pig | 1. 8 days |
| 1. Sheep | 1. 10 days |
| 1. Cattle | 1. 14 days |
| 1. Human | 1. 16 days |

1. **a-i, b-ii, c-iii, d-iv**
2. a-iii, b-iv, c-ii, d-i
3. a-iv, b-i, c-ii, d-iii
4. a-ii, b-iii, c-iv, d-i
5. Match the following; (Homologies organ of male reproductive system in different animal):

|  |  |
| --- | --- |
| **A** | **B** |
| 1. Mesonephric duct | 1. Glans penis, Corpus penis |
| 1. Mullerian duct | 1. Raphe of scrotum and   penis |
| 1. Urogenital sinus | 1. Epididymis |
| 1. Genital tubercle | 1. Appendage of testis |
| 1. Urethral folds | 1. Bulbourethral glands, Prostate gland |

1. a-i, b-ii, c-iii, d-iv, e-v
2. **a-iii, b-iv, c-v, d-i, e-ii**
3. a-iv, b-i, c-ii, d-v, e-iii
4. a-ii, b-iii, c-iv, d-v, e-i
5. Match the following; (Age of puberty in different female animal):

|  |  |
| --- | --- |
| **A** | **B** |
| 1. Cattle | 1. 6-8 months |
| 1. Sheep | 1. 6-10 months |
| 1. Goat | 1. 4-15 months |
| 1. Horse | 1. 4-15 months |
| 1. Pig | 1. 12-18months |

1. a-i, b-ii, c-iii, d-iv, e-v
2. a-iii, b-iv, c-v, d-i, e-ii
3. a-iv, b-i, c-ii, d-v, e-iii
4. **a-ii, b-iii, c-iv, d-v, e-i**
5. Match the following; (Placentation type):

|  |  |
| --- | --- |
| **A** | **B** |
| 1. Zonary | 1. Mare |
| 1. Diffuse | 1. Cattle |
| 1. Cotyledonary | 1. Guinea pig |
| 1. Haemochorial | 1. Queen |
| 1. Discoidal | 1. Monkey |

1. a-i, b-ii, c-iii, d-iv, e-v
2. a-iii, b-iv, c-v, d-I, e-ii
3. **a-iv, b-i, c-ii, d-v, e-iii**
4. a-ii, b-iii, c-iv, d-v, e-i