

# *Study & Master*

**Support Pack | Grade 12**



**Module 5 Units 3 – 4**

# **Agricultural Sciences**

## **Animal reproduction**

This support pack for the **Animal reproduction** module in the **Agricultural Sciences Grade 12 CAPS curriculum** provides valuable revision activities. All activities have the answers provided. Learners can work through these individually at home or these could form the basis of a catch-up class or online lesson. You have permission to print or photocopy this document or distribute it electronically via email or WhatsApp.

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## Module 5 – Animal reproduction

### Unit 3 Artificial insemination (AI)

#### Short questions

1. Various possible answers are provided for the following questions. Write only the correct letter (A–D) next to the question number.
  - 1.1 The characteristic that is observed during the microscopic evaluation of quality of semen is .....
    - A volume
    - B colour
    - C abnormalities
    - D density
  - 1.2 Which ONE of the following is not part of the process of artificial insemination?
    - A artificial vagina
    - B semen storage
    - C pistolette
    - D natural mating
  - 1.3 Which ONE of the following is not a disadvantage of artificial insemination?
    - A Semen of superior bulls is used.
    - B Undesirable traits are transferred to more offspring.
    - C Testing and storage of semen, oestrus synchronisation and insemination is expensive.
    - D Genetic variability in a herd decreases.
  - 1.4 Which ONE of the following is not a characteristic of good-quality semen?
    - A viability and motility
    - B thick whitish to yellowish fluid
    - C pH higher than 7
    - D volume of 4–8 ml per ejaculate
  - 1.5 Which ONE of the following is not a dilutant for collected semen?
    - A buffers such as egg yolk
    - B lipids such as skim milk
    - C liquid nitrogen
    - D antibiotics such as penicillin5 × 2 (10)
2. Supply ONE word/term for each of the following descriptions. Write only the word/term next to the question number.
  - 2.1 The process of freezing collected semen
  - 2.2 The chemical element in which semen is stored
  - 2.3 The state of the chemical element mentioned in 2.2 in which semen is stored
  - 2.4 The temperature at which the chemical element mentioned in 2.2 is stored
  - 2.5 The term used to describe the number of sperm in one millilitre of ejaculate5 × 2 (10)
3. In the table below a description and TWO possible answers are given. Decide whether the description in column B relates to A only, B only, both A and B or neither A nor B of the answers in column A.

Column A			Column B
3.1	A	Pistolette	Instrument used to inject semen into the uterus of the female animal during artificial insemination
	B	Pipette	
3.2	A	Copulation	Process that may be replaced by artificial insemination
	B	Ejaculation	

Column A			Column B
3.3	A	Liquid nitrogen tank	Instrument used to collect semen from a superior bull
	B	Artificial vagina	
3.4	A	Abnormal tails	Characteristics of good-quality semen collected from a superior bull
	B	Alkaline pH	
3.5	A	Desirable genetic traits	Advantages of artificially inseminating cows using semen of purebred bulls
	B	Frozen semen	

5 × 2 (10)

### Longer questions

4. To keep registered superior bulls on a farm is very expensive, even dangerous, and therefore many farmers make use of good-quality semen of superior bulls and replace natural mating with a method whereby the reproductive life of a bull can be extended long after its natural ability to serve and fertilise cows, even after the death of the bull.
  - 4.1 Identify this technique of fertilising cows without natural mating taking place. (1)
  - 4.2 Indicate FOUR characteristics of good, fertile semen. (4)
  - 4.3 Briefly describe the treatment of the frozen semen before it is used for insemination. (2)
  - 4.4 Identify the instrument used to inseminate the cows. (1)
  - 4.5 Suggest the best time for insemination after a cow shows the first signs of oestrus. (2)
  - 4.6 Briefly explain the negative effect on a cow if the inseminator is not well trained. (3)
  - 4.7 Supply the main reason for the increase in the commercial value of the herd when this insemination technique is used. (2)
  - 4.8 Name TWO ways in which the spread of diseases can be prevented or controlled when this insemination technique is used. (2)
  - 4.9 The secretion of which hormone leads to the behaviour where cows mount each other? (1)
  - 4.10 Name THREE effects of high levels of the hormone mentioned in 4.9 on the cow during the heat period. (3)

## Unit 4 Embryo transplantation (ET) and nuclear transfer (NT)

### Short questions

1. Various possible answers are provided for the following questions. Write only the correct letter (A–D) next to the question number.
  - 1.1 One of the following is NOT an important stage of reproduction:
    - A copulation
    - B fertilisation
    - C ingestion
    - D parturition
  - 1.2 Differentiation of cells into different tissues, organs and systems occurs in the ..... stage during pregnancy.
    - A ovum
    - B embryonic
    - C foetal
    - D parturition
  - 1.3 Which ONE of the following is the correct order of development after fertilisation of the ovum by the sperm?
    - A zygote – morula – blastocyst – implantation
    - B zygote – blastocyst – morula – implantation
    - C zygote – implantation – blastocyst – morula
    - D zygote – morula – implantation – blastocyst

1.4 Which ONE of the following is not a reason for abortion?

- A mummification
- B maceration
- C pregnancy
- D resorption

1.5 The respiratory and digestive systems of the embryo develop from the .....

- A inner endoderm
- B middle mesoderm
- C outer endoderm
- D inner ectoderm

5 × 2 (10)

2. Supply ONE word/term for each of the following descriptions. Write only the word/term next to the question number.

2.1 The process during which female reproductive cells are released for fertilisation

2.2 The process in which a cow is treated with hormones to produce many more ova

2.3 The process in which the nucleus of a female egg cell is removed for nuclear transfer

2.4 The layer that surrounds the embryo from which the heart, skeleton, muscles, uro-genital and vascular systems develop

2.5 The termination of pregnancy before the end of the normal gestation period

5 × 2 (10)

3. Change the underlined words in each of the following statements to make the statements TRUE.

3.1 Embryo flushing can be used to obtain multiple identical offspring with desirable traits from a single embryo.

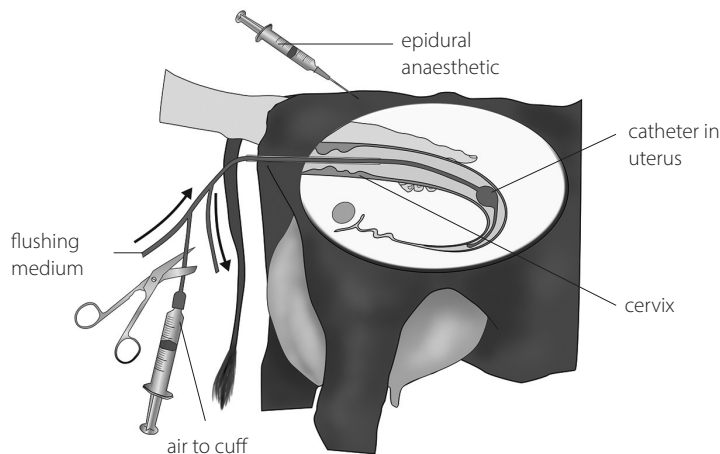
3.2 During the process of in vitro fertilisation an enucleated egg is obtained.

3.3 The cloned embryo is genetically identical to the enucleated egg cell.

3.4 Reproductive cloning is performed to derive embryonic stem cells that can be used for cell therapy to cure diseases.

3.5 The desirable genetic traits carried in the cytoplasm of the nucleus taken from a superior donor cow are transferred to the enucleated egg cell during nuclear transfer.

5 × 2 (10)



### Longer questions

4. Study the diagram alongside that illustrates a technique used in animal reproduction and then answer the questions that follow.

4.1 Identify the process that is illustrated in the diagram. (1)

4.2 Explain the reasons for using a flushing medium in this technique. Refer to the functions of the flushing medium and to the arrows indicated in the diagram. (4)

4.3 State the main benefit of using this technique on female animals in a herd. (1)

5. The diagram alongside illustrates a process that occurs during reproduction.

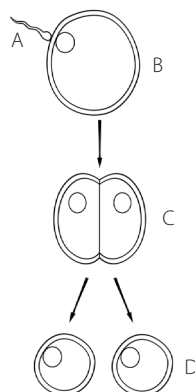
5.1 Identify the process that takes place between parts A and B. (1)

5.2 Label parts A to D. (4)

5.3 Tabulate the differences between A and B on the one hand and C and D on the other hand with relation to 'n' and '2n'. (6)

5.4 Identify the type of twins that develops in the diagram. (1)

5.5 Tabulate the differences between twins that develop from a single ovum and twins that develop from two different ova. (10)



- 5.6 Which one of the two sets of twins mentioned in 5.4 may have a sterile female? Indicate the term used to describe this phenomenon. (2)
- 5.7 Name the section of part A that is responsible for the following:
- 5.7.1 motility (1)
- 5.7.2 carrier of genetic information (1)
- 5.8 Name the organ in which A is formed. (1)

## Memorandum

### Unit 3

#### Short questions

- 1.1 C      1.2 D      1.3 A      1.4 C      1.5 C (10)
- 2.1 Cryopreservation      2.2 Nitrogen      2.3 Liquid      2.4 -196 °C (10)
- 2.5 Concentration (10)
- 3.2 A      3.2 A and B      3.3 B      3.4 Neither A nor B (10)
- 3.5 A and B (10)

#### Longer questions

- 4.1 Artificial insemination (AI) (1)
- 4.2 Characteristics of good, fertile semen (any four):
- Opaque/thick whitish or yellowish fluid
  - Milky
  - Sticky
  - Viability
  - Motility
  - Less than 15% dead sperm cells
  - No deformed sperm
  - No blood or urine in sperm
  - No odour – it should smell like fresh milk
  - Normal morphology/structure/normal acrosome, head, neck, middle piece and tail (4)
- 4.3 Treatment of frozen semen before insemination:
- Frozen semen is thawed
  - Straws placed in water between 32 °C and 35 °C (2)
- 4.4 Pistolette (1)
- 4.5 Best time for inseminating:
- 12 hours after the first signs of oestrus
  - In the morning when signs of oestrus were detected in the afternoon and vice versa (2)
- 4.6 Negative effects on the cow if the inseminator is not well trained:
- The inseminated cow might sustain injuries.
  - The reproductive life of the cow is shortened.
  - Pain and stress could be experienced. (3)
- 4.7 Good quality semen is used that should improve the genetics of the herd. (2)
- 4.8 Ways of preventing the spread of diseases (any two):
- Use of sterilised/clean apparatus/tools
  - Use of good quality semen
  - Avoiding injuries (2)
- 4.9 Oestrogen (1)
- 4.10 Effects of high levels of oestrogen on the cow during the heat period (any three):
- Responsible for the final preparation of the uterine wall/thickens the lining of the uterus/prepares the uterus for the implantation of the fertilised ovum
  - Stimulates the gland in the brain to release LH
  - Stimulates the process of ovulation through the release of LH

- Increased blood supply to the uterus
- Relaxing the muscles of the cervix
- Preventing bacterial infection of the uterus
- Delaying the secretion of FSH at the end of oestrus
- Responsible for heat signs

(3)

## Unit 4

### Short questions

1.1 C      1.2 B      1.3 A      1.4 C      1.5 A (10)

2.1 Ovulation      2.2 Superovulation      2.3 Enucleation      2.4 Mesoderm (10)

2.5 Abortion (10)

3.1 Splitting      3.2 Cloning      3.3 Adult donor cell      3.4 Therapeutic (10)

3.5 DNA (10)

### Longer questions

4.1 Flushing of fertilised eggs/embryos from the female uterus/Embryo transplantation/Embryo transfer (1)

4.2 Reasons for using flushing medium:

- The liquid flushing medium is used to move the embryos in the uterus.
- The flushing medium is firstly injected into the uterus through the reproductive canal.
- Then the flushing medium is forced out of the animal and the embryos are caught.
- The liquid medium protects the embryos while they are moved.

(4)

4.3 Main benefit of using this technique

- A large number of offspring from a single superior animal
- OR
- Surrogate/recipient cows reproduce valuable offspring

(1)

5.1 Fertilisation/Fusion of gametes (1)

5.2 A – Sperm cell/Spermatozoon/Male reproductive cell/Male gamete  
 B – Ovum/Egg cell/Female reproductive cell/Female gamete/Ootid  
 C – Zygote/Blastocyst/Zona pellucida  
 D – Foetus/Embryo (4)

5.3 Differences between n and 2n:

A and B (n)	C and D (2n)
<ul style="list-style-type: none"> <li>• Haploid</li> <li>• One set of chromosomes (from either the male gamete/sperm/spermatozoon or from the female gamete/female egg cell/ovum)</li> <li>• Half the number of chromosomes of diploid cells</li> </ul>	<ul style="list-style-type: none"> <li>• Diploid</li> <li>• Two sets of chromosomes (one set from the male gamete/sperm/spermatozoon and one set from the female gamete/female egg cell/ovum)</li> <li>• Double the number of chromosomes of haploid cells</li> </ul>

(6)

5.4 Identical/Monozygotic twins (1)

5.5 Differences between twins:

Twins from a single ovum	Twins from two different ova
<ul style="list-style-type: none"> <li>• Monozygotic/Identical</li> <li>• Share placenta</li> <li>• Separate amniotic sacs</li> <li>• Genetically and physically identical</li> <li>• Same sex</li> </ul>	<ul style="list-style-type: none"> <li>• Dizygotic/Fraternal</li> <li>• Each twin has its own placenta</li> <li>• Separate amniotic sacs</li> <li>• Differ genetically and physically</li> <li>• Same or different sexes</li> </ul>

(10)

5.6 Dizygotic/Fraternal twins. Freemartinism (2)

5.7.1 Tail/Flagellum (1)

5.7.2 Head/Nucleus (1)

5.8 Testes (1)