

Agricultural Sciences

TEST & EXAM PREPARATION

Liesl Sterrenberg, Grace Elliott & Helena Fouché

GRADE

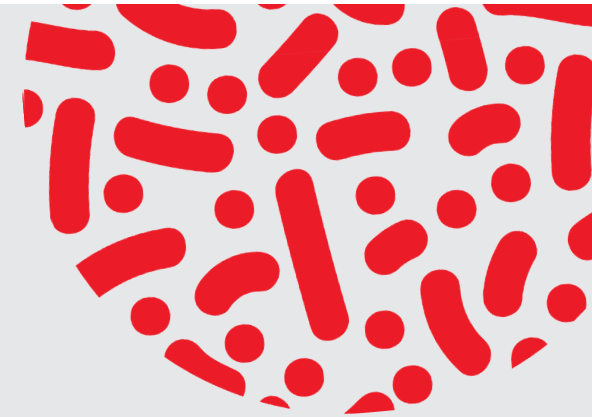
12

CAPS

2-in-1



THE
ANSWER
SERIES *Your Key to Exam Success*



Grade 12 **Agricultural Sciences** 2-in-1 CAPS

TEST & EXAM PREPARATION

This 2-in-1 study guide presents the challenging content material of Grade 12 Agricultural Sciences in an easy-to-use format that stimulates consistent revision as well as pre-exam consolidation.

Key Features:

- Illustrated skills summary
- Curriculum-based check lists per topic
- Comprehensive terminology lists per topic
- Questions and answers per topic
- Exam papers and memos
- Answers and memos in a separate booklet

As you work methodically through this study guide, you will become increasingly prepared to achieve excellent results in your exams.

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THIS STUDY GUIDE INCLUDES

1

Questions per Topic on:

- Animal Nutrition
- Animal Production, Protection and Control
- Animal Reproduction
- Agricultural Management and Marketing
- Factors of Production
- Basic Agricultural Genetics

2

Exam Papers

(all answers in separate booklet)

E-book
available 



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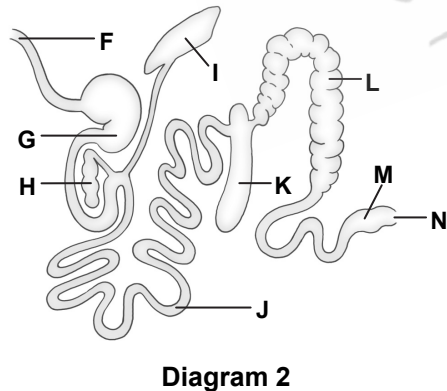
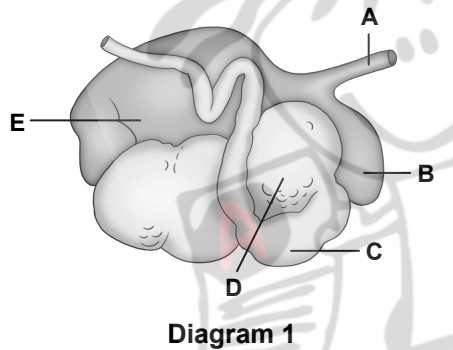
All Answers to Topic-based Questions
as well as the Memos to the
Exam Papers are compiled in
a separate booklet.



- 4.18 Hay is produced when a green crop is kept under anaerobic conditions for fermentation and development of lactic acid.
- 4.19 Urea is a white water-soluble substance used to supplement carbohydrates in the rations and licks of ruminants.
- 4.20 Molasses is the compound used as a cheap non-protein nitrogen source for ruminant animals.
- 4.21 The Punnett square is a method used to determine the combined ratio of two feed components to get a required nutrient value.
- 4.22 A production ration provides just enough nutrients to keep an animal alive and in the same condition.
- 4.23 A supplement programme is a strategic plan for livestock farmers to ensure that there is sufficient feed to meet the requirements of farm animals throughout the year. (23 × 1) (23)

Question 5

The diagrams below represent the digestive systems of two farm animals.



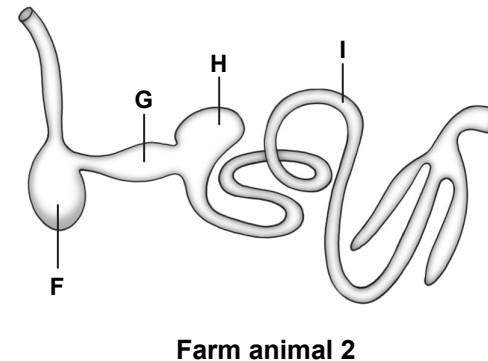
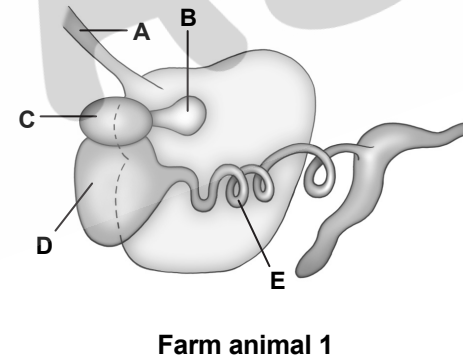
- 5.1 Complete the table below by writing down the answers next to the question numbers (5.1.1 - 5.1.4).

Digestive systems of farm animals		
Diagram	Type of animal	Example of a farm animal
Diagram 1	5.1.1	5.1.2
Diagram 2	5.1.3	5.1.4

- (4)
- 5.2 Identify the labels marked with the letters **A - N**. (14)
- 5.3 Indicate a letter in Diagram 1 as well as in Diagram 2 where hydrochloric acid is secreted. (2)

Question 6

The diagrams below shows the digestive systems of two different farm animals.



External parasites/ectoparasites

- Define the term external parasite
- Distinguish between the most important external parasites:
 - Ticks** - identify and describe the life cycle of:
 - one-host ticks (e.g. blue tick)
 - two-host ticks (e.g. red-legged tick, bont-legged tick)
 - three-host ticks (e.g. brown-ear tick, bont tick)
 - Nasal worm** (sheep)
 - Blowflies, lice and mites** (sheep)
- Explain the financial implications and detrimental effect of external parasites
- Describe the basic preventative/control measures of external parasites

PLANT AND METALLIC SALT POISONING

Plant poisoning

- Identify and describe the maize fungus, poison bulb and thorn apple as examples of plant poisoning
- Discuss the treatment of animals suffering from plant poisoning
- Describe the preventative/control measures of plant poisoning

Poisoning by metallic salts

- Identify and describe common salt and urea poisoning (the symptoms and treatment)
- Indicate the preventative/control measures of salt poisoning

THE ROLE OF THE GOVERNMENT IN ANIMAL HEALTH

- Describe the basic principles of good health to control animal diseases and parasites/pests
- Indicate the role of the state in animal health

TERMINOLOGY AND CONCEPTS

Use this **reference list** to extend your understanding of **terms** in Agricultural Sciences. It is vital to know your terms and definitions. This list is **more than definitions**, it provides an **extensive explanation** for each term and places it in context. Refer to this list as you study the content and work through the questions and answers.

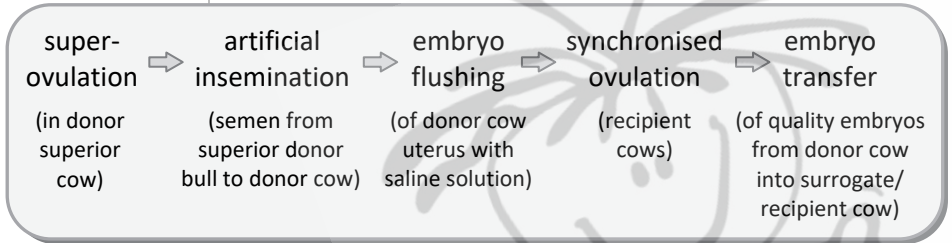
ANIMAL PRODUCTION SYSTEMS



production systems	different approaches that a farmer may take to maximise output depending on the environment and management practices
intensive animal production system/ intensive farming	an agricultural production system with high inputs of capital, labour and technology and high outputs due to animals kept in confined areas at high stocking density, controlled temperature and fed constantly for rapid growth e.g. feedlot, battery system, broiler chickens, pigsty
extensive animal production system/ extensive farming	an agricultural production system with low inputs of capital, minimal human interference (only supplements, medicines, fencing, water), and less technology on larger areas of land where animals find their own food and shelter e.g. sheep in the Karoo
production of scale	the size of agricultural production – the average cost per unit of production decreases as the size of the farm increases
sustainable production	farming practice that balances the utilisation of vegetation and avoid overgrazing/erosion to ensure the vegetation survives and natural resources are available for future use
subsistence/ small-scale farming	a simple farming system of low cost, low-productivity farming where products of a smaller farm supply the needs of a family using traditional technology and causing minimal pollution

EMBRYO TRANSPLANTATION/TRANSFER (ET)

embryo	an early stage of development from fertilised egg/zygote to foetus
embryo transfer/transplantation (ET)	reproductive technology that improves gene pool (herd quality) where a superior donor cow is stimulated to ovulate (superovulation) and inseminated with semen from superior bull (artificial insemination) – after 1 week the fertilised ova/embryos are washed out of the donor uterus (embryo flushing), collected in insemination straws and transplanted into recipient cow (in oestrus) to produce offspring that inherit genes of superior bull and cow donors



donor cow	a genetically superior cow that is treated with hormones to produce many ova via superovulation that will be fertilised <i>in vivo</i> (in the body) or <i>in vitro</i> (outside the body)
recipient cow/surrogate	physically healthy cow that receives embryos/fertilised eggs transplanted from donor cow, to carry the pregnancy and produce a genetically superior calf
embryo flushing/harvesting	removal of viable embryos (using a saline solution) from a superior donor cow that was inseminated during oestrus by a superior donor bull
ovulation	process by which an oocyte is released from the mature follicle in the ovary during oestrus
superovulation	stimulating a donor cow with hormones (FSH) to produce many ova in one oestrus cycle

embryo splitting	separation of cells in a developing embryo and transplantation into recipient cows to produce multiple offspring
<i>in vitro</i> fertilisation (IVF)	ova extracted from donor cow and fertilised with donor sperm from a superior bull, developed externally and then implanted into recipient cows by embryo transfer (ET)

NUCLEAR TRANSFER/CLONING

nuclear transfer (NT)/somatic cell nuclear transfer (SCNT)/cloning	<p>a laboratory process that produces a genetically identical copy of the original animal/cell/tissue by transferring the nucleus of a somatic cell into a enucleated egg cell:</p> <ul style="list-style-type: none"> nucleus removed from egg cell (enucleated ovum) and discarded nucleus removed from somatic/body cell of superior donor animal and inserted into enucleated egg cell egg cell is cultured and electrically stimulated to develop into an embryo embryo implanted into uterus of recipient/surrogate cow embryo develops into foetus and newborn that is genetically identical to donor animal
reproductive cloning	cloned embryos implanted in uterus of recipient cows to produce offspring that are identical copies (clones) of donor animal
therapeutic cloning	cloned embryos are produced to provide stem cells that develop into new tissues/organs to replace diseased/damaged tissues in medical procedures
clone	a genetically identical copy of the original cell/tissue/organism
enucleation	removal of a nucleus from a cell for nuclear transfer
cryo-preservation	process of preserving and storing biological cells/tissues at very low temperatures

Question 45

A family fruit tree business was started on 34 hectares (ha). It was later scaled down to 12 hectares and is now very successful. This success can be attributed to the introduction of pigs, chickens and sheep to the farm. The waste from these animals is used to make compost. The business also buys surplus fruit from neighbouring farms to make dried fruit and jam. Five guest cottages have been built on the farm. The kitchen waste from the guest cottages is used for the compost-from-worms project on the farm.

- 45.1 Identify the risk management strategy employed by this family business. (1)
- 45.2 Give **one** reason for the answer to Question 45.1. (1)
- 45.3 Suggest **two** primary sources of risk in a farming business. (2)
- 45.4 State the general business management skills applied by the manager of the family business in the following situations:
 - 45.4.1 the smooth functioning of the different enterprises of the family business with the same workforce (1)
 - 45.4.2 processing and analysing the market information and realising there was a greater demand for organic products in the global markets (1)
 - 45.4.3 developing positive relations with workers, suppliers and the markets (1)
- 45.5 Define the concept *strategic management* of a farm. (2)

Question 46

Factors or forces that influence a farming business enable farmers to plan accordingly, particularly with regard to risk. External forces are those things which the farmer has little or no control over. However, they are critical to the success of the farming business. Internal forces either strengthen or hamper a business. It requires an effective manager to ensure that all the phases of production are carried out successfully.

- 46.1 From the scenario, list **two** effects of internal forces on a business. (2)
- 46.2 Suggest **three** internal forces that can make a farming business successful. (3)

Question 47

What sets farm management apart from other business management is the kind and number of daily duties involved, as well as the many management layers involved in farming. Even among farms, the process will vary depending on the type of farming business involved and the overall size of the business. Specific skills are therefore needed for different farming operations.

- 47.1 Identify **two** reasons from the scenario to justify why managing a poultry farm is different from managing a shop. (2)
- 47.2 Mention the specific management skills required in the following:
 - 47.2.1 being able to keep the farm profitable and successful (1)
 - 47.2.2 being able to deal with labour problems (1)
 - 47.2.3 being able to deal with unforeseen issues or problems (1)
- 47.3 Outline **two** production risks that a farm manager may experience in crop production. (2)

Question 48



- 48.1 Define the concept *farm management*. (2)
- 48.2 Indicate **three** components of strategic management. (3)
- 48.3 Explain conceptual skills as used in business management skills. (2)
- 48.4 State **three** socio-cultural forces that affect agricultural enterprises. (3)

- Identify and describe the current uses/application of genetically modified plants
- Indicate the techniques used to genetically modify plants/animals



Techniques of GM in animals:

- micro-injection
- retroviral vectors

Techniques of GM in plants:

- recombinant DNA
- electroporation uses electric currents to penetrate plant cells with desired gene
- micro-injection transfers desired gene directly into recipient nucleus
- gene gun (biolistic delivery) fires tiny gold-coated gene particles into the plant embryo
- bacteria e.g. *Agrobacterium tumefaciens*



- Name the characteristics of GMOs



Characteristics of GMOs include: heat or cold-resistant crops, pesticide-resistant crops, high nutritive crops, stronger, disease-resistant animals, iron-rich milk for human consumption.


- Indicate the potential risks of GMOs
- Describe the potential benefits of genetically modified crops

TERMINOLOGY AND CONCEPTS

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MONOHYBRID AND DIHYBRID INHERITANCE

heredity	the transfer of genetic characteristics from generation to generation
genetics	the study of heredity; how characteristics are passed from parents to offspring
gene	unit of inheritance composed of a segment of DNA on a chromosome that codes for a particular characteristic
DNA (deoxyribonucleic acid)	large molecule (polymer) in the nucleus that forms the hereditary material of chromosomes and carries all the genetic instructions for cell functioning
	DNA → gene → chromatid → chromosome
genetic trait	characteristic that is coded in the genes and passed from parents to offspring
chromosome	thread-like structure visible in the nucleus of a dividing cell; consists of two chromatids joined by a centromere and composed of DNA that carries genetic information
locus	specific position of a gene on a chromosome

Question 22

In an animal production unit the following data of heifers has been collected for breeding purposes:

Live mass (kg)	134	135	136	137	138	139	140	141	142	143	144	145	146
Number of animals	10	15	20	30	40	60	75	65	45	35	15	10	5

- 22.1 Give the appropriate term for the phenomenon represented by the data above. (1)
- 22.2 Determine the number of heifers if 12% of the total number of heifers are selected. (3)
- 22.3 Use the data to find the mass of an average heifer. (1)
- 22.4 In a normal commercial production unit, what would a farmer do with:
 - 22.4.1 heifers with the highest live mass (1)
 - 22.4.2 heifers with the lowest live mass (1)

Question 23

A commercial farmer has seven different breeds of sheep on four different experimental farms. There is a huge variation in the weights of the sheep on different farms. The record of samples of the lambs picked from the four farms are as follows:

Kilogram	Number of lambs
20 - 29	2
30 - 39	5
40 - 49	8
50 - 59	10
60 - 69	6
70 - 79	3
80 - 89	2

- 23.1 Translate the information in the table to a line graph. (5)
- 23.2 State **two** environmental causes of variation in the weight of the lambs. (2)
- 23.3 Indicate whether the characteristic that caused the type of variation in the table is qualitative or quantitative. (1)
- 23.4 Justify your answer in Question 23.3. (2)

Question 24

Mutagens change the genetic material of an organism causing errors in the genes of organisms. How will the following mutagenic agents affect the DNA structure of the gene?

- 24.1 gamma and X-rays (1)
- 24.2 metals such as nickel and chromium (1)
- 24.3 viruses (1)



Question 25

The table below shows the estimated breeding value (EBV) for specified characteristics in Bonsmara cattle and Boer goats.

Species	Characteristic	Heritability
Bonsmara	Birth weight	38
	Post-weaning weight	30
	Meat tenderness	65
	Lean meat	38
Boer goat	Birth weight	35
	Post-weaning weight	60
	Lean meat	35
	Fleece weight	12

ANSWERS TO TOPIC-BASED QUESTIONS

TOPIC

1

ANIMAL NUTRITION

Question 1

- | | |
|--------|--------|
| 1.1 C | 1.2 C |
| 1.3 A | 1.4 A |
| 1.5 C | 1.6 A |
| 1.7 B | 1.8 C |
| 1.9 A | 1.10 D |
| 1.11 B | 1.12 B |
| 1.13 B | 1.14 A |
| 1.15 D | 1.16 C |
| 1.17 A | 1.18 C |
| 1.19 B | 1.20 B |
| 1.21 C | 1.22 B |
| 1.23 D | 1.24 C |
| 1.25 D | 1.26 B |
| 1.27 D | 1.28 D |
| 1.29 D | 1.30 B |
| 1.31 C | 1.32 B |
| 1.33 C | |

$$\begin{aligned}
 DC &= \frac{\text{DM intake (kg)} - \text{DM excreted (kg)}}{\text{DM intake (kg)}} \times \frac{100}{1} \\
 &= \frac{12 \text{ kg} - 3 \text{ kg}}{12 \text{ kg}} \times \frac{100}{1} \\
 &= \frac{9}{12} \times \frac{100}{1} = 75\%
 \end{aligned}$$



1.34 A

1.35 D

1.36 D to produce good quality milk - proteins of a high BV is needed

1.37 B a protein that provides all the amino acids required by an animal would have a high BV



1.38 B egg protein has a BV of 100 and other proteins are compared with it

1.39 C feed with a narrow NR contains more than 60% digestible proteins with a low fibre content

1.40 C
$$\frac{\text{number of parts maize meal}}{\text{total number of parts}} = \frac{22}{22+7} = \frac{22}{29} = 75,9\%$$

1.41 B

1.42 D

1.43 D

1.44 C

1.45 A

1.46 C
$$\begin{aligned}
 \text{non-nitrogen content} &= \text{TDN} - \text{DP} \\
 &= 75\% - 12\% \\
 &= 63\%
 \end{aligned}$$


1.47 A DP is low (only 10%) - fibre has a low % DP

21.3 Continuous variation

- complete range of characteristics from one extreme to another

Discontinuous variation

- has a few clear-cut forms/no intermediate forms in between

21.4 • process of choosing/identifying specific individuals

- for their desired characteristics/traits
- to be used in the production of quality offspring.

Question 22

22.1 continuous variation

22.2 Total:

$$10 + 15 + 20 + 30 + 40 + 60 + 75 + 65 + 45 + 35 + 15 + 10 + 5 = 425 \checkmark$$

$$\therefore 12\% (0,12) \times 425 \checkmark = 51 \text{ heifers } \checkmark \text{ are selected}$$

22.3 Average mass = 140 kg

look for the biggest
'Number of animals'
in the table

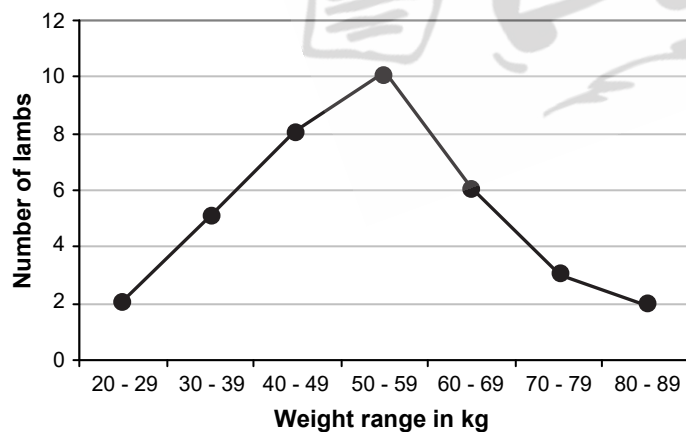
22.4.1 selection for breeding purposes

22.4.2 cull/slaughter/sell

Question 23

23.1

Variation in the weight of different breeds of sheep



(2)

(3)

(1)

(3)

(1)

(1)

(1)

23.2 • diet

• shelter

• pest and diseases

• water

• climate

(any 2) (2)

23.3 quantitative

(1)

23.4 • the characteristic is measurable/or can be quantified

- can take on a whole series of values like body size/weight/wool production, etc.

(2)

Question 24

24.1 damages DNA molecule and causes it to break

(1)

24.2 change the chemical structure of a DNA molecule

(1)

24.3 insert their own DNA

(1)

Question 25

25.1 Bonsmara - meat tenderness

Boer goat - post-weaning weight

(2)

25.2 The heritability of both characteristics is greater than 50% **OR** more controlled by genes

(2)

25.3 • heritability is less than 50%

- characteristics will be more influenced by the environment **OR** less controlled by genes

(2)

Marking guidelines:

- line graph ✓
- correct heading ✓
- correct labelling of x and y axes ✓
- correct scaling ✓
- correct plotting of points ✓



(5)