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Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

NATIONAL SENIOR CERTIFICATE

GRADE 12

AGRICULTURAL SCIENCES P2

NOVEMBER 2021

MARKS: 150

TIME: 2½ hours

This question paper consists of 16 pages.

INSTRUCTIONS AND INFORMATION

1. This question paper consists of TWO sections, namely SECTION A and SECTION B.
2. Answer ALL the questions in the ANSWER BOOK.
3. Start EACH question on a NEW page.
4. Number the answers correctly according to the numbering system used in this question paper.
5. You may use a non-programmable calculator.
6. Show ALL calculations, including formulae, where applicable.
7. Write neatly and legibly.

SECTION A**QUESTION 1**

- 1.1 Various options are provided as possible answers to the following questions. Choose the correct answer and write only the letter (A–D) next to the question numbers (1.1.1 to 1.1.10) in the ANSWER BOOK, e.g. 1.1.11 B.

1.1.1 An event where buyers come together to bid for farm produce:

- A Agricultural show
- B Co-operative farming
- C Liquidity
- D Auction

1.1.2 ONE of the following is NOT associated with the advantages of free marketing:

- A Stabilising the prices of agricultural products
- B Sales are for cash
- C Selling quality products
- D Entrepreneur shows initiative and drive

1.1.3 In a situation where the dairy farmer produces less cheese than the amount demanded, the price of cheese is likely to ...

- A decrease.
- B remain the same.
- C increase.
- D remain constant.

1.1.4 The following applies to selling:

- (i) Management is profit-orientated
- (ii) Short-term objective is to sell the product
- (iii) Emphasis is on the product
- (iv) Customer needs are neglected

Choose the CORRECT combination:

- A (i), (ii) and (iv)
- B (ii), (iii) and (iv)
- C (i), (ii) and (iii)
- D (i), (iii) and (iv)

1.1.5 The following is NOT a problem associated with labour as a production factor:

- A Lack of training
- B Competition from industries
- C Shortage of labourers
- D Better living and working conditions

1.1.6 Money paid by the farmer over and above what was borrowed from the financial institution:

- A Loan
- B Interest
- C Debt
- D Capital

1.1.7 The management principle whereby the farmer monitors production and compares the results with the expected output:

- A Control
- B Implementation
- C Planning
- D Manipulation

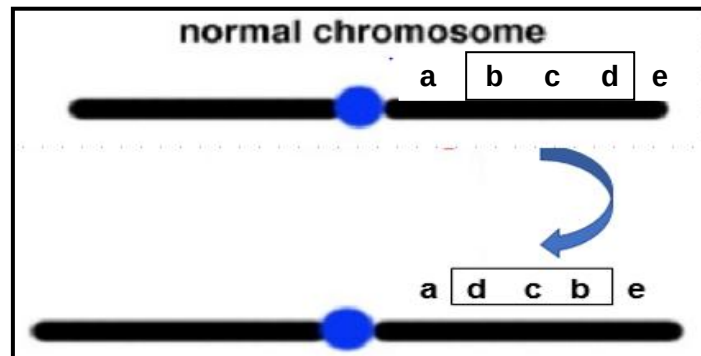
1.1.8 The following statements refer to the law of diminishing returns:

- (i) The addition of one unit of a production factor will not ensure a proportional increase in yield with time.
- (ii) A continuous addition of inputs will initially increase the output drastically, but at a certain point the output increases at a decreasing rate.
- (iii) An increase in fertiliser will result in a continuous increase in production.
- (iv) With an increase in fertiliser, production will start to increase and then at a certain point it decreases with additional fertilisers.

Choose the CORRECT combination:

- A (i), (iii), and (iv)
- B (ii), (iii) and (iv)
- C (i), (ii) and (iv)
- D (i), (ii) and (iii)

- 1.1.9 The schematic representation below shows ... which causes chromosome mutation.



- A deletion
B translocation
C inversion
D duplication

- 1.1.10 A sheep has 27 pairs of chromosomes in the nucleus. The number of autosomes are ...

- A 27.
B 52.
C 54.
D 02.

(10 x 2) (20)

- 1.2 Choose a term from COLUMN B that matches a description in COLUMN A. Write only the letter (A–J) next to the question numbers (1.2.1 to 1.2.5) in the ANSWER BOOK, e.g. 1.2.6 K.

COLUMN A	COLUMN B
1.2.1 Part of a business plan that provides an overall plan of action to promote sales	A management B bull
1.2.2 Stages of activity in supply-demand chain from the point of production to consumption	C agri-demand chain D enterprise budget
1.2.3 The document showing the amount of money the farmer thinks will be spent and earned on beef production	E marketing strategy F labour
1.2.4 An effective combination and co-ordination of human, physical and financial resources to maximise profit	G controlled marketing H agri-marketing chain
1.2.5 The farm animal that determines the sex of a calf	I whole farm budget J cow

(5 x 2) (10)

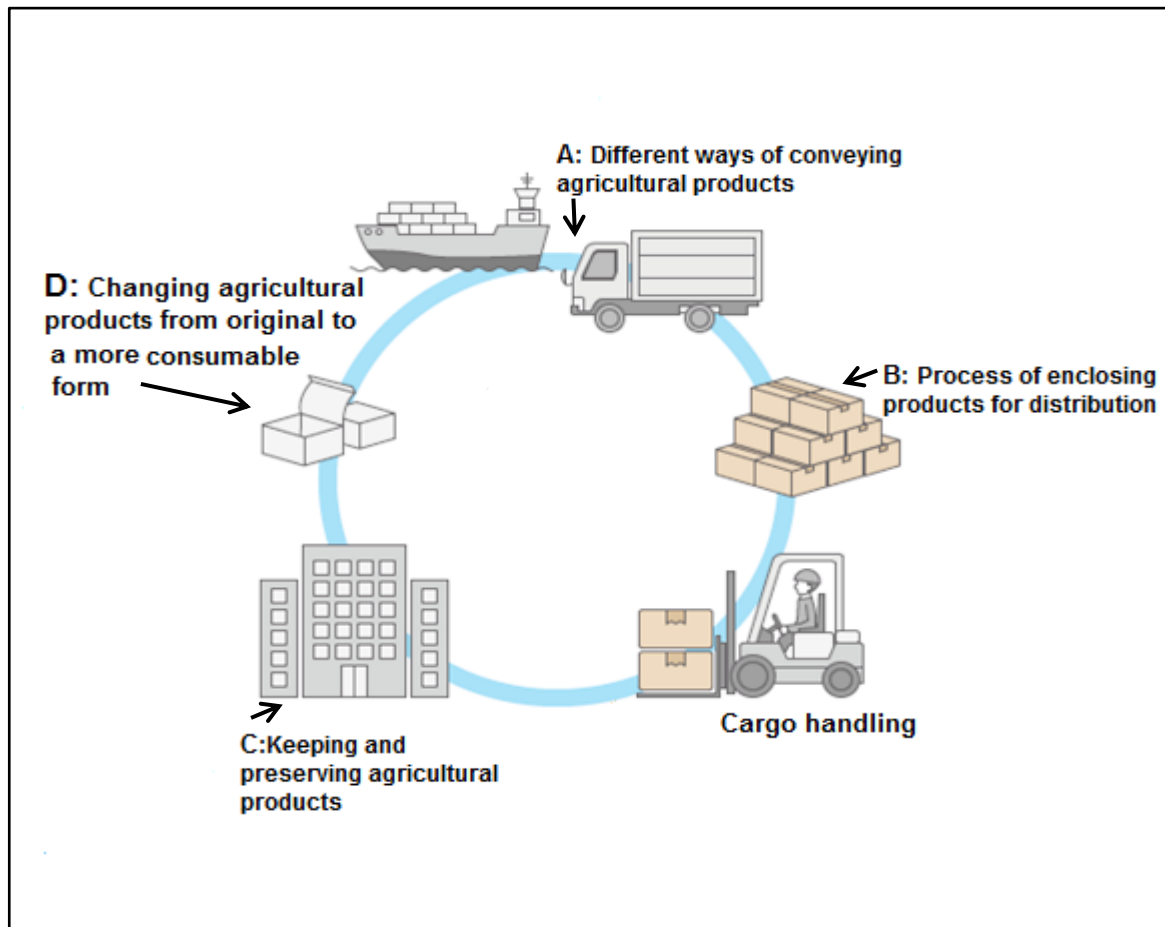
- 1.3 Give ONE word/term for each of the following descriptions. Write only the word/term next to the question numbers (1.3.1–1.3.5) in the ANSWER BOOK.
- 1.3.1 A form of sustainable agricultural marketing that takes environmental concerns into consideration in production processes
- 1.3.2 Money, manufactured goods and assets that can be used for production of other goods to generate income
- 1.3.3 The type of selection whereby an individual is chosen based on records of its ancestors
- 1.3.4 An animal breeding system that often leads to the production of sterile offspring
- 1.3.5 The total number of gene effects that are inherited by the progeny that will determine their performance for breeding purposes (5 x 2) (10)
- 1.4 Change the UNDERLINED WORD(S) in each of the following statements to make them TRUE. Write only the answer next to the question numbers (1.4.1 to 1.4.5) in the ANSWER BOOK.
- 1.4.1 Fresh produce marketing is a channel where a farmer sells the produce at the point of production.
- 1.4.2 Medium-term credit is the money borrowed from a financial institution to cover operational expenses.
- 1.4.3 Electroporation involves the use of fat carriers of the required DNA through the cell membrane into a nucleus.
- 1.4.4 Prepotency means that both alleles are equally dominant and visible in the phenotype of the offspring.
- 1.4.5 Multiple alleles refer to a large group of genes that each add to the value of certain phenotypic characteristics. (5 x 1) (5)

TOTAL SECTION A: 45

SECTION B**QUESTION 2: AGRICULTURAL MANAGEMENT AND MARKETING**

Start this question on a NEW page.

- 2.1 The illustration below shows the different marketing functions of agricultural products.



- 2.1.1 Identify the marketing function illustrated by **A** and **D**. (2)
- 2.1.2 Name TWO guidelines for marketing function **B**. (2)
- 2.1.3 Give THREE factors hampering the marketing of agricultural products. (3)

- 2.2 The picture below shows a group of farmers meeting and discussing issues that will contribute towards their mutual economic and social needs.



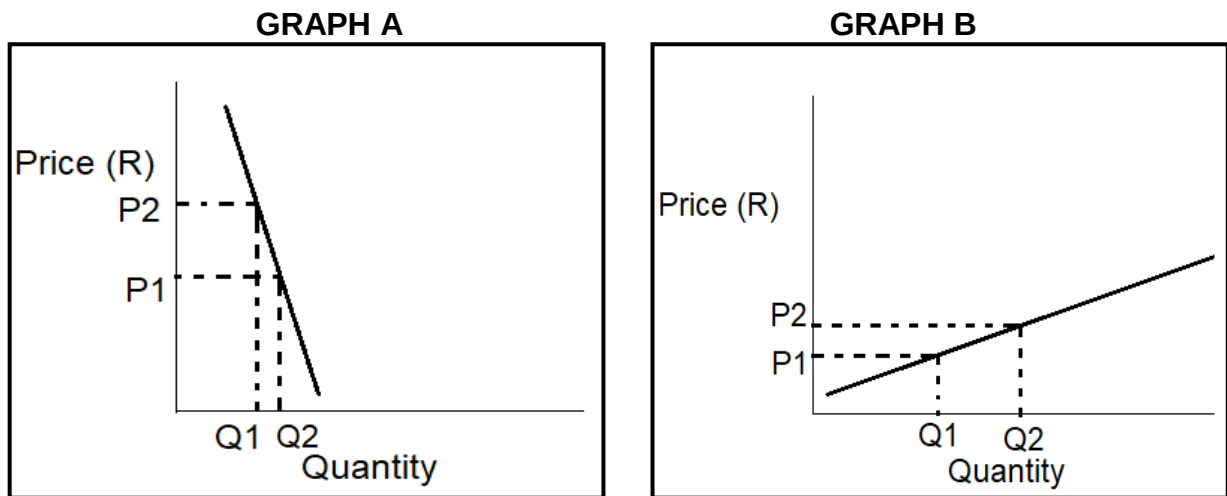
- 2.2.1 Identify the type of marketing system represented by the farmers in the picture above. (1)
- 2.2.2 Name TWO principles of the marketing system identified in QUESTION 2.2.1. (2)
- 2.2.3 Explain how the following will benefit the farmers in the marketing system identified in QUESTION 2.2.1:
- (a) Members enjoy economies of scale in buying and selling (2)
 - (b) Bargaining power (2)

- 2.3 The table below shows the supply and demand of oranges at different prices.

PRICE (R/kg)	QUANTITY DEMANDED (kg)	QUANTITY SUPPLIED (kg)
6	1 400	200
8	1 200	400
10	1 000	600
12	800	800
14	600	1 000
16	400	1 200
18	200	1 400

- 2.3.1 Use the information provided in the table above to draw a line graph representing both supply and demand curves on the same set of axes. (6)
- 2.3.2 Identify the price in the table above where there will be:
- (a) The largest shortage of oranges in the market (1)
 - (b) The lowest surplus of oranges in the market (1)
- 2.3.3 Determine the equilibrium price for oranges in the table above. (1)

2.4 The graphs below illustrate elasticity of supply and demand.



2.4.1 Identify the graph (A or B) above that represents each of the following:

- (a) Price elasticity of supply (1)
- (b) Price inelasticity of demand (1)

2.4.2 Give a reason for the answers to QUESTION 2.4.1(a) and (b). (2)

2.4.3 State TWO factors that affect demand. (2)

2.5 A young successful livestock farmer started farming in the dry region of South Africa. After the farmer had received a young heifer as a gift, the heifer gave birth to a calf which was then raised and sold at a good price. With the money the farmer received, he bought five calves. The young farmer now owns 18 cows and 1 790 hectares of land. The farmer employs four permanent farm workers. The cows' calving rate is 98%.

2.5.1 The young livestock farmer qualifies to be an entrepreneur. Justify this statement. (1)

2.5.2 Deduce TWO entrepreneurial success factors for the farmer from the scenario above. (2)

2.5.3 Identify the following in the scenario above:

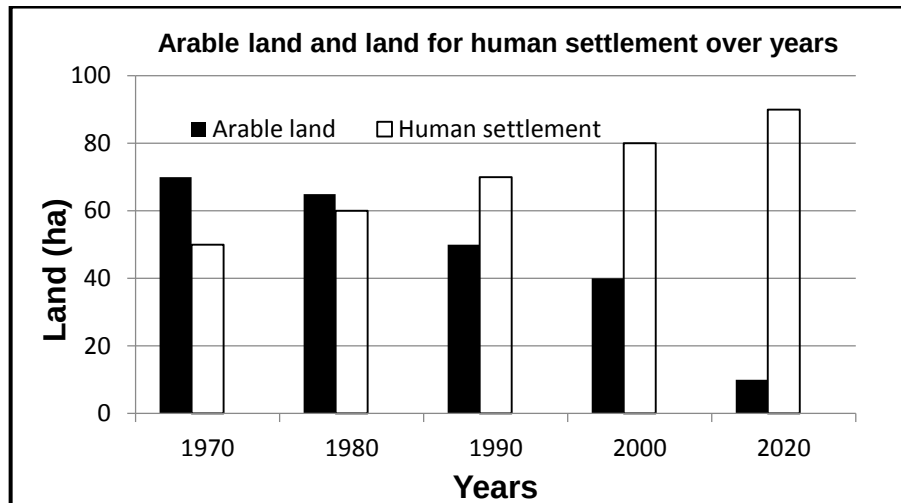
- (a) TWO strengths of the farming business (2)
- (b) ONE threat to the business (1)

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QUESTION 3: PRODUCTION FACTORS

Start this question on a NEW page.

- 3.1 The graph below shows the hectares of land available for cultivation and human settlement for a small community over years.



- 3.1.1 Deduce the following from the graph above:
- (a) An economic characteristic of land depicted (1)
 - (b) A function of land as a production factor (1)
- 3.1.2 Give a reason for the answer to QUESTION 3.1.1(a). (1)
- 3.1.3 State TWO functions of land not reflected in the graph above. (2)
- 3.1.4 Indicate TWO methods farmers can apply to improve land productivity as from the year 2020 to ensure a constant supply of food. (2)

3.2

The agricultural sector is one of the industries that was hard hit by the Covid-19 pandemic. The virus affected mostly the older, experienced labourers that resulted in their deaths. Farmers had to rely on inexperienced workers for tasks such as fencing and harvesting.

3.2.1 Identify, in the scenario above, the TWO main types of labourers employed on a farm based on the period of employment. (2)

3.2.2 Identify, in the scenario above, the task that is done by each of the following:

(a) Casual labourers (1)

(b) Seasonal labourers (1)

3.2.3 Identify the labour problem in the scenario above. (1)

3.2.4 Name the method that farmers can put in place to address the problem identified in QUESTION 3.2.3. (1)

3.3

The table below shows the conditions of employment on **FARM A** and **FARM B**.

CONDITIONS OF EMPLOYMENT	FARM A LABOURER	FARM B LABOURER
Rate/day (R)	120	200
Normal working hours/week	52	40
Leave days/year	14	30
Overtime payment	R35/hour	R50/hour

3.3.1 Identify, in the table above, the employee whose conditions of employment are unfair. (1)

3.3.2 Give TWO reasons to support the answer to QUESTION 3.3.1. (2)

3.3.3 Name the labour legislation that the employer has violated. (1)

- 3.4 The table below shows the value of capital items in a farming enterprise over a period of five years.

YEAR	VALUE IN RAND (R)	
	CAPITAL ITEM A	CAPITAL ITEM B
2016	350 000	1 200 000
2017	280 000	1 250 000
2018	250 000	1 300 000
2019	150 000	1 400 000
2020	90 000	1 500 000

- 3.4.1 Identify the capital item representing each of the following:

(a) Fixed capital (1)

(b) Movable capital (1)

- 3.4.2 Give an example of each capital item in QUESTION 3.4.1. (2)

- 3.4.3 Deduce the problem of capital as reflected by capital item **A** in the table above. (1)

- 3.5 The table below shows the financial record for the first quarter of the year.

MONTHS	JANUARY	FEBRUARY	MARCH
AMOUNTS	(R)	(R)	(R)
OPENING BALANCE	2 500	18 372	29 472
RECEIPTS			
Cash sales on crops	15 322	9 500	2 800
Rental	10 000	10 000	10 000
TOTAL	25 322	19 500	12 800
PAYMENTS			
Salaries/Wages	6 000	4 900	3 200
Seeds and fuel	3 450	3 500	1 100
TOTAL	9 450	8 400	4300
CLOSING BALANCE	18 372	29 472	37 972

- 3.5.1 Identify the financial record shown in the table above. (1)

- 3.5.2 Give a reason to support the answer to QUESTION 3.5.1. (1)

- 3.5.3 Indicate the total amount available to run the enterprise at the beginning of the second quarter. (1)

- 3.5.4 Calculate the total costs over the first quarter. (2)

3.6 Name the management skill that will enable the manager to do the following:

- (a) Dealing with labour problems (1)
- (b) Avoiding financial losses on the farm (1)
- (c) Allocating labourers and available resources appropriately (1)

3.7 A farming business is coupled with risk factors and the manager must be able to deal with risks before they have an impact on the business.

3.7.1 Indicate the risk management strategy applicable to each of the situations below:

- (a) The farmer joins a co-operative where they produce and market as a collective (1)
- (b) The farmer keeps livestock, grows crops and is also involved in agritourism activities (1)

3.7.2 Name THREE factors that are beyond the direct control of the farmer which can affect the farming business.

(3)
[35]

QUESTION 4: BASIC AGRICULTURAL GENETICS

Start this question on a NEW page.

- 4.1 Gregor Mendel was the first person to study how the characteristics of pea plants are transferred from parents to offspring.

4.1.1 Name the term that refers to the study in the statement above. (1)

4.1.2 State TWO of Mendel's laws of inheritance. (2)

- 4.2 Feather colour in chickens is controlled by the following two pairs of genes:

- **Colour gene** – with the alleles B = black and b = white
- **Epistatic gene** – with the alleles L = no colour and l = with colour

GENOTYPE	PHENOTYPE
BbLl	4.2.1
Bbll	4.2.2
bbll	4.2.3

Use the above information to complete the table (4.2.1– 4.2.3). (3)

- 4.3 The diagram below shows parents and their offspring. (Bb) represents a farm animal with horns and (bb) a farm animal with no horns (polled).

♂	♀	B	b
	B	BB	Bb
	b	Bb	bb

4.3.1 Identify a phenotype visible in the offspring. (1)

4.3.2 Calculate the percentage of offspring with the homozygous recessive phenotype. (2)

- 4.4 A dominant homozygous boar was mated with a heterozygous sow. In the F₁-generation, all the offspring were red. In the F₂-generation, a genetically unknown boar was mated with a heterozygous sow from the F₁-generation above resulting in half the offspring being white.

4.4.1 Use the letters (R) for red and (r) for white to draw a Punnet square and determine the ratio of the genotypes in the first crossing. (5)

4.4.2 Indicate, from the information above, the genotype of the genetically unknown boar used in the F₂-generation. (1)

4.5 In a breeding programme two green pepper cultivars were crossed to produce offspring for a specific purpose.

4.5.1 Give the genetic term for each of the following:

- (a) A drastic improvement in the yield of the offspring was achieved (1)
- (b) The two individual cultivars were picked based on the records of their respective offspring (1)
- (c) Measuring the biological characteristics by using computer technology (1)

4.5.2 Explain why the two cultivars above were used in the breeding programme. (2)

4.6 The table below indicates the values of different hereditary traits for sheep.

HEREDITARY CHARACTERISTICS	BIRTH WEIGHT	POST-WEANING GAIN	LEAN MEAT	FLEECE WEIGHT
HERITABILITY (%)	53	60	37	57

4.6.1 Identify the characteristic with the lowest improvement in the breeding programme. (1)

4.6.2 Refer to the table above and indicate the hereditary characteristic that should be focused on for the most effective improvement in the following situations:

- (a) A farmer having a feedlot (1)
- (b) A stud farmer supplying pure-bred animals to other commercial mutton farmers to be used for breeding (1)
- (c) A wool farmer (1)

4.6.3 Name ONE other factor to improve the post-weaning gain (production output) in a flock of sheep. (1)

- 4.7 **CROSSINGS A, B and C** below represent different breeding systems applied in cattle production systems.

A	B	C
Holstein stud bull X Breeding of inferior cows and repeated breeding with their offspring	Hereford bull X Hereford cow (bull's daughter)	Afrikaner bull X Shorthorn cow

- 4.7.1 Identify the breeding systems represented by **CROSSINGS A, B and C**. (3)

- 4.7.2 State TWO disadvantages of the breeding system represented by **CROSSING B**. (2)

- 4.8 The picture below shows a technique used to insert genetic material into the nucleus of a cell.



- 4.8.1 Identify, in the picture above, the technique used to genetically modify organisms. (1)
- 4.8.2 Differentiate between *conventional hybrid cultivars* and *GMOs*. (2)
- 4.8.3 State TWO potential risks associated with genetically modified plants. (2)

[35]

TOTAL SECTION B: 105
GRAND TOTAL: 150