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Department:
Basic Education
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# SENIOR CERTIFICATE EXAMINATIONS/
# NATIONAL SENIOR CERTIFICATE EXAMINATIONS

## AGRICULTURAL SCIENCES P2

## 2023

**MARKS: 150**

**TIME: 2½ hours**

**This question paper consists of 15 pages.**

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## 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.

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## SECTION A

## QUESTION 1

1.1 Various options are provided as possible answers to the following questions. Choose the 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 The quantity of the product which can be purchased by consumers at a given price:

A Buying
B Supply
C Demand
D Selling

1.1.2 A situation in the market where the price of goods is held constant regardless of the cost of production is known as price …

A determination.
B fixing.
C establishment.
D setting.

1.1.3 ONE of the following is a guideline for packaging fresh produce:

A Package must not include information about the produce
B Packaging material must contain chemicals
C Container should be soft for easy handling
D Produce should fit well inside the container

1.1.4 The following occurs in a market when the price of a product is high:

(i) The demand is high and the supply is low
(ii) The demand is low and the supply is high
(iii) The more the products, the more producers are willing to sell
(iv) The willingness to buy a product decreases

Choose the CORRECT combination:

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

1.1.5 An economic concept where production output does not increase at the same rate as fertiliser application increases:

A Law of diminishing returns
B Law of supply
C Law of demand
D Law of inelasticity

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1.1.6 A financial record showing the receipts and payments over a given period:

A Budget statement
B Income statement
C Cash flow statement
D Balance sheet

1.1.7 The management principle which involves the evaluation of plans and remediation to achieve the set goals:

A Motivation
B Coordination
C Organisation
D Control

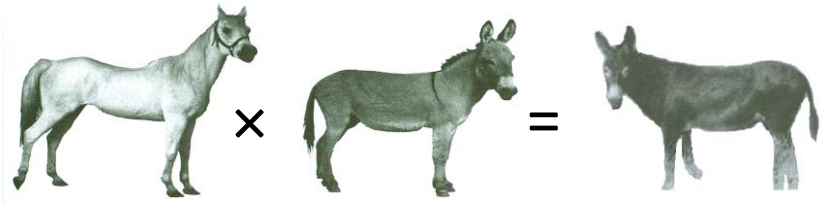
1.1.8 Labourers can cause losses in a production enterprise if they are not …

(i) skilled in their job.
(ii) supervised.
(iii) motivated.
(iv) experiencing work related challenges.

Choose the CORRECT combination.

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

1.1.9 The illustration below shows a breeding system known as …



A species crossing.
B inbreeding.
C crossbreeding.
D upgrading.

1.1.10 A modification technique where a gene gun is used to fire bullets coated with desired genes is known as …

A microinjection.
B electroporation.
C biolistic.
D bacterial carriers. (10 x 2) (20)

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1.2 Choose a word/term from COLUMN B that matches a description in COLUMN A. Write only the letter (A–H) 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 | Quantity of products supplied exceeds quantity demanded | A | sex-linked |
| | | B | grant |
| 1.2.2 | Marketing approach that promotes and sells the same product in different ways to different groups of consumers | C | surplus |
| | | D | interpersonal |
| 1.2.3 | The funding provided for a specific purpose and not repaid | E | mass marketing |
| 1.2.4 | A management skill that needs a farmer to understand taxation and interest rates | F | shortage |
| | | G | financial |
| 1.2.5 | A characteristic represented by $X^hY$ with $X^HX^h$-genotype | H | height |

(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 to 1.3.5) in the ANSWER BOOK.

1.3.1 The process of attracting consumers to a specific product through various forms of communication

1.3.2 A measure of production output in the labour force

1.3.3 The genetic characteristics that give rise to a range of phenotypes

1.3.4 An individual that has different alleles for a particular gene on each homologous chromosome

1.3.5 A type of risk which occurs when genes from genetically modified crops are transferred to wild plants making them herbicide resistant

(5 x 2) (10)

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1.4 Change the UNDERLINED WORD 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 In controlled marketing, products from individual producers are placed together, graded and handled as one mass.

1.4.2 A list of assets on the farm is known as liability.

1.4.3 The law of dominance states that an organism possesses two alleles which separate so that each gamete receives only one allele.

1.4.4 Artificial selection is where only individuals that are best suited to the environment survive.

1.4.5 Biometrics is the degree to which a characteristic is determined mostly by genes. (5 x 1) (5)

**TOTAL SECTION A: 45**

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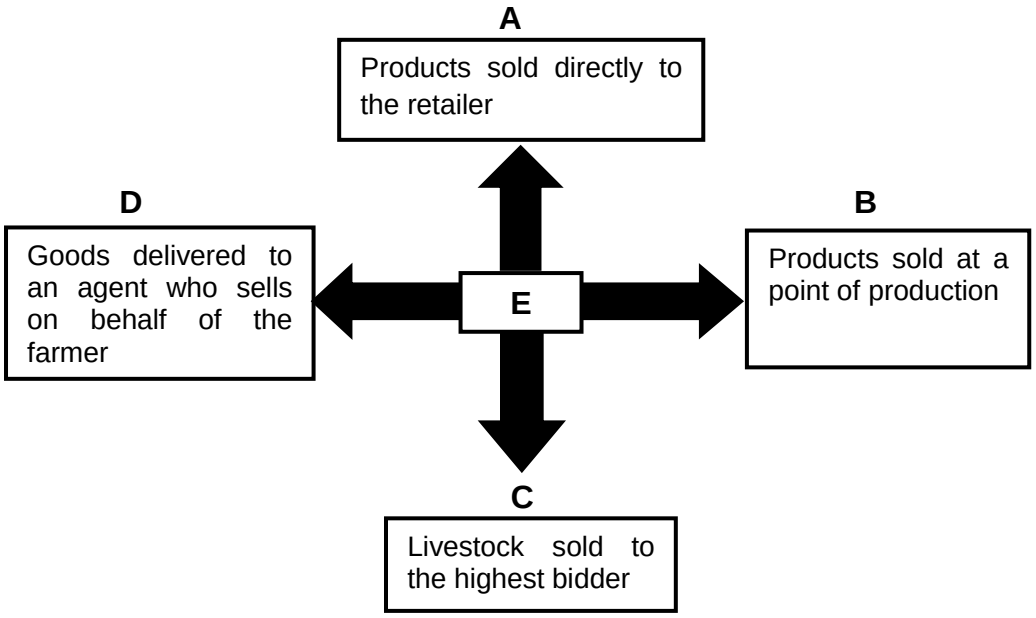
## SECTION B

## QUESTION 2: AGRICULTURAL MANAGEMENT AND MARKETING

Start this question on a NEW page.

2.1 The schematic representation below shows various channels used when marketing agricultural products.




2.1.1 Identify the following in the schematic representation above:

(a) Marketing system **E** (1)

(b) Marketing channel **A** (1)

2.1.2 Write down the letter (**A**–**E**) that represents the marketing channel that matches EACH of the following descriptions:

(a) The farmer has to pay commission (1)

(b) No transport costs by the farmer (1)

2.1.3 State TWO disadvantages of the marketing system identified in QUESTION 2.1.1(a). (2)

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2.2 The table below shows the demand of two products at varying prices.

| PRODUCT | PRICE 1 (R/BAG) | DEMAND (BAG) | PRICE 2 (R/BAG) | DEMAND (BAG) |
|---|---|---|---|---|
| **A** | 10 | 200 | 15 | 100 |
| **B** | 20 | 200 | 25 | 190 |

2.2.1 Identify the product with the demand that is:

(a) Price inelastic (1)

(b) Price elastic (1)

2.2.2 Give a reason for the answer to QUESTION 2.2.1(a). (2)

2.2.3 State TWO factors that might have resulted in price elasticity of the product identified in QUESTION 2.2.1(b). (2)

2.3 The pictures below illustrate factors that may hamper the marketing of agricultural products.

| PICTURE A<br>TRANSPORTATION | PICTURE B<br>STORAGE |
|---|---|
| | |

2.3.1 Deduce a problem associated with each factor above that may hamper the marketing of agricultural products as represented below:

(a) Picture **A** (1)

(b) Picture **B** (1)

2.3.2 Indicate how the problem in QUESTION 2.3.1(a) could be addressed to ensure an improved agri-business chain. (1)

2.3.3 Indicate ONE cost factor aligned to Picture **B** that may have an impact on the marketing of the agricultural product. (1)

2.3.4 State TWO roles of legislation in the effective marketing of agricultural products. (2)

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2.4 The table below shows the quantities of wheat supplied and demanded at varying prices over a period of five years.

| YEAR | PRICE (R/ton) | WHEAT SUPPLIED (tons) | WHEAT DEMANDED (tons) |
|---|---|---|---|
| 2018 | 450 | 180 | 230 |
| 2019 | 500 | 190 | 210 |
| 2020 | 650 | 200 | 175 |
| 2021 | 720 | 220 | 165 |
| 2022 | 800 | 250 | 140 |

2.4.1 Draw a bar graph showing the quantities of wheat supplied and demanded from 2018 to 2022. (6)

2.4.2 Deduce from the table above the trend of each of the following over a period of five years:

(a) Quantities supplied (1)

(b) Quantities demanded (1)

2.5 A group of farmers started a milling project to assist people from the surrounding areas to grind maize into maize meal. They organised a milling machine and other relevant equipment. Then they started the business with five workers. The business grew very fast and within a period of two years they had fifteen workers.

2.5.1 Identify TWO phases of entrepreneurship in the scenario above. (2)

2.5.2 Name the marketing function in the scenario above. (1)

2.5.3 Give an advantage of the marketing function named in QUESTION 2.5.2 for the community. (1)

2.6 The statements below show the aspects of a SWOT analysis:

A The farmer lacks capital and management skills to run an enterprise
B Increasing interest rates render the enterprise less competitive
C New markets are opening
D The farmer has a lot of land to run a farming enterprise

2.6.1 State ONE purpose of a SWOT analysis in a business. (1)

2.6.2 Write down the letter (**A**–**D**) representing the statement that addresses EACH of the following aspects of the SWOT analysis:

(a) Opportunity (1)

(b) Threat (1)

(c) Weakness (1)

(d) Strength (1)

**[35]**

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## QUESTION 3: PRODUCTION FACTORS

Start this question on a NEW page.

3.1 Below is a list of production factors.

A Capital
B Management
C Land
D Labour

3.1.1 In the list above, identify the production factor where each of the following is applicable:

(a) Used as collateral (1)

(b) Used to pay the salaries of farm workers (1)

(c) The farmer (1)

3.1.2 Justify the answer to QUESTION 3.1.1(a). (1)

3.2 The table below shows the projection of a population size and arable land in a certain region from 1983 to 2023.

| YEARS | POPULATION SIZE (million) | ARABLE LAND (million hectares) |
|---|---|---|
| 1983 | 24 | 12 |
| 1993 | 29 | 10 |
| 2003 | 34 | 8 |
| 2013 | 39 | 6 |
| 2023 | 44 | 4 |

3.2.1 Deduce the economic characteristic of land illustrated in the table above. (1)

3.2.2 Give TWO functions of land that are evident in the table above. (2)

3.3 HIV/Aids has a negative impact on the productivity of farm workers.

3.3.1 Indicate TWO implications of HIV/Aids for the agricultural sector. (2)

3.3.2 Name ONE measure farmers can take to address the problem of HIV/Aids on the farm. (1)

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3.4 The following personnel are employed on the farm:

- A dairy foreman
- Two general workers
- A brick-layer
- An electronic feeding machine operator

3.4.1 Identify, in the list of personnel above, an example of each of the following:

(a) Casual worker (1)

(b) Manager (1)

(c) Unskilled worker (1)

(d) Skilled worker (1)

3.4.2 Indicate the legislation that regulates each of the following:

(a) Payment as a result of an accident in a work place (1)

(b) Provision of security when workers become unemployed (1)

(c) Hours of work, leave and working on public holidays (1)

3.5 The table below shows a financial record showing the expected expenditure and income of a horticultural farming enterprise.

| EXPECTED EXPENDITURE | | EXPECTED INCOME | |
|---|---|---|---|
| **ITEM** | **AMOUNT (R)** | **ITEM** | **AMOUNT (R)** |
| Irrigation | 10 300 | Flowers (shop) | 150 000 |
| Manure | 22 400 | Flowers (nursery) | 40 000 |
| Fuel | 13 300 | Compost | 7 500 |
| Labour | 24 500 | | |
| Potting soil | 8 800 | | |
| Vegetative material | 45 500 | | |
| Chemicals | 18 700 | | |
| **TOTAL EXPENDITURE** | | **TOTAL INCOME** | |

3.5.1 Identify the type of financial record represented in the table above. (1)

3.5.2 Use a formula to calculate the profit or loss of this enterprise. (Show ALL calculations.) (4)

3.5.3 Indicate whether the farmer should continue or not with the enterprise. (1)

3.5.4 Give a reason for the answer to QUESTION 3.5.3. (1)

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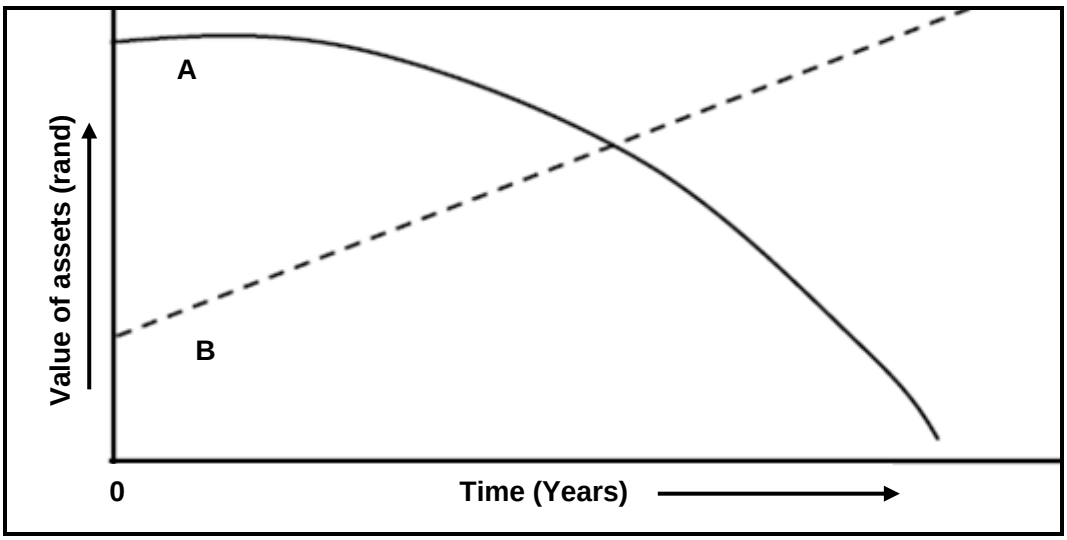
3.6 The graph below represents the value of different types of assets in a crop production enterprise.




3.6.1 Identify the curve (**A** or **B**) that represents the following:

(a) Movable capital assets (1)

(b) Fixed capital assets (1)

3.6.2 Give a reason to support the answer to QUESTION 3.6.1(b). (1)

3.6.3 State TWO problems of capital as a production factor. (2)

3.7 A farming business should be managed well to be financially successful and to ensure that the business achieves its intended goals and objectives. The farmer should therefore be able to cope with risks that may prevail.

3.7.1 Name TWO types of risks that can influence a farming business. (2)

3.7.2 Give TWO sources of risks in farming businesses. (2)

3.7.3 State TWO risk management strategies. (2)
**[35]**

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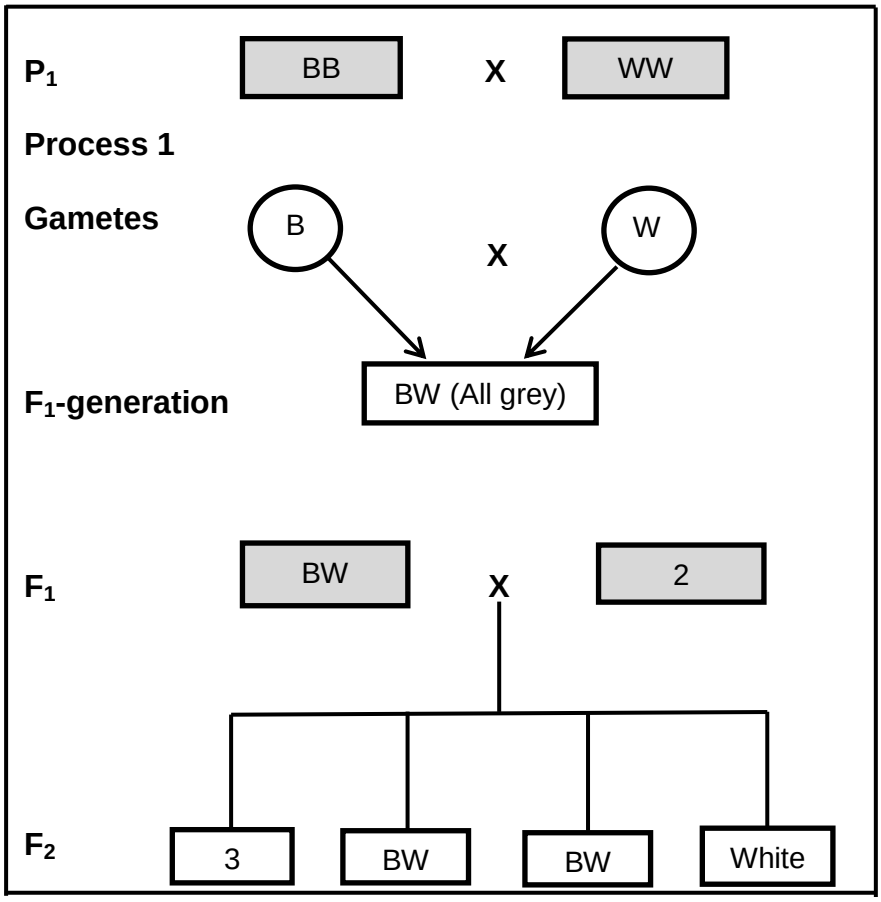
## QUESTION 4: BASIC AGRICULTURAL GENETICS

Start this question on a NEW page.

4.1 The illustration below shows a crossing between a black bull (**B**) and a white cow (**W**).




4.1.1 Identify the pattern of inheritance in the diagram above. (1)

4.1.2 Justify the answer to QUESTION 4.1.1. (1)

4.1.3 Label each of the following represented in the diagram above:

(a) Process by **1** (1)

(b) Genotype by **2** (1)

(c) Phenotype **3** (1)

4.1.4 Write down each of the following:

(a) Genotypic ratio of the $F_1$-generation (1)

(b) Phenotypic ratio of the $F_2$-generation (1)

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4.2 Farmers from three provinces bought tomato seeds, which were genetically identical, from plant breeders. The tomatoes were grown in different provinces but planted and harvested on the same dates.

The table below shows the yield of the tomatoes for the three farmers in the three different provinces.

| PROVINCE | YIELD (TONS) |
|---|---|
| 1 | 35 |
| 2 | 20 |
| 3 | 60 |

4.2.1 Identify the genetic phenomenon represented by the data in the table above. (1)

4.2.2 State THREE possible causes of the phenomenon that could have led to the results in the table above. (3)

4.3 The different types of mutagenic agents that lead to variation are shown in the block below.

| chemical; biological; physical |
|---|

Match the types of mutagenic agents above with their effects below:

(a) Abnormal cell division resulting in polyploidy caused by colchicine (1)

(b) Radiation such as X-rays damages the DNA molecule and causes it to break (1)

(c) Bacteria cause inflammation that releases chemicals which damage the DNA molecule (1)

4.4 Selection of superior animals is very crucial to farmers for breeding purposes.

4.4.1 Indicate the most accurate method used by farmers to select animals. (1)

4.4.2 Name ONE other method that is used by farmers to select animals. (1)

4.4.3 Give ONE reason why variation in selection and breeding is important. (1)

4.4.4 Differentiate between *crossbreeding* and *inbreeding*. (2)

4.5 In goats, the allele for black fur (B) is dominant over the allele for brown fur (b). A brown-furred goat is crossed with a heterozygous black-furred goat.

4.5.1 Use a Punnett square to determine the genotype of the $F_1$-generation offspring. (4)

4.5.2 Calculate the percentage of black-furred goats. (2)

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4.6 The length of mohair in goats is controlled by two pairs of genes. The base length for a recessive goat is **aabb** which is 25 cm long. Each additive allele contributes 3 cm to the base length.

4.6.1 Identify the pattern of inheritance controlling the length of mohair in goats. (1)

4.6.2 Give a reason for the answer to QUESTION 4.6.1. (1)

4.6.3 Calculate the length of mohair in goats with genotype AABb. (2)

4.6.4 Indicate another genotype of goats with mohair of the same length as the one in QUESTION 4.6.3. (1)

4.7 Breeders using genetic modification have become predominant in many developing countries.

4.7.1 Define the term *genetic modification.* (2)

4.7.2 Give TWO aims of genetic modification of plants and animals. (2)

4.7.3 State ONE advantage of genetic modification over the traditional method. (1)

**[35]**

**TOTAL SECTION B: 105**
**GRAND TOTAL: 150**

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